Agilent Technologies
U3025AE10

User's Guide

Use this manual with the following documents:
PNA Series Network Analyzer On-line Help System and
Application Note 1408-12

Agilent Technologies

Manufacturing Part Number: U3025-90001

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Safety Notes

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WARNING	**Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

CAUTION	Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

Statement of Compliance

This product has been designed and tested in accordance with the standards listed on the Manufacturer's Declaration of Conformity, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Definitions

- *Specifications* describe the performance of parameters covered by the product warranty (temperature –0 to 55 °C, unless otherwise noted.)
- *Typical* describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- *Nominal* values indicate expected performance or describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- *Characteristic Performance* describes performance parameter that the product is expected to meet before it leaves the factory, but is not verified in the field and is not covered by the product warranty. A characteristic includes the same guard bands as a specification.

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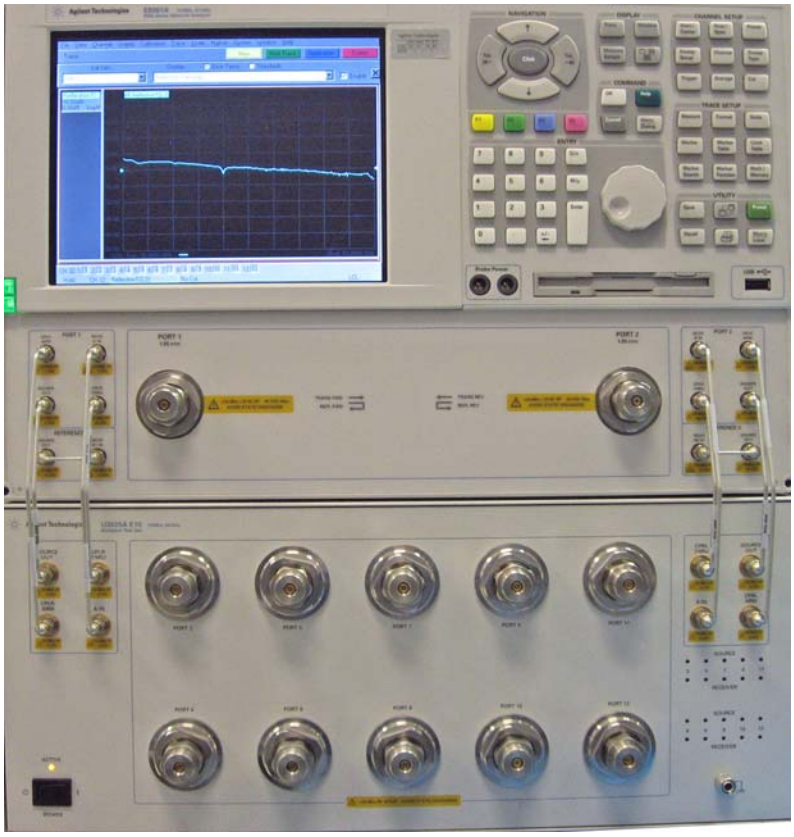
U3025AE10

Introduction

This document describes how to use the U3025AE10 Multiport Test Set with the Agilent E8363/4B/C 2-Port and the N5230A/C 2-Port PNA Network Analyzer.

Figure 1 E8364B/C 2-Port PNA and U3025AE10



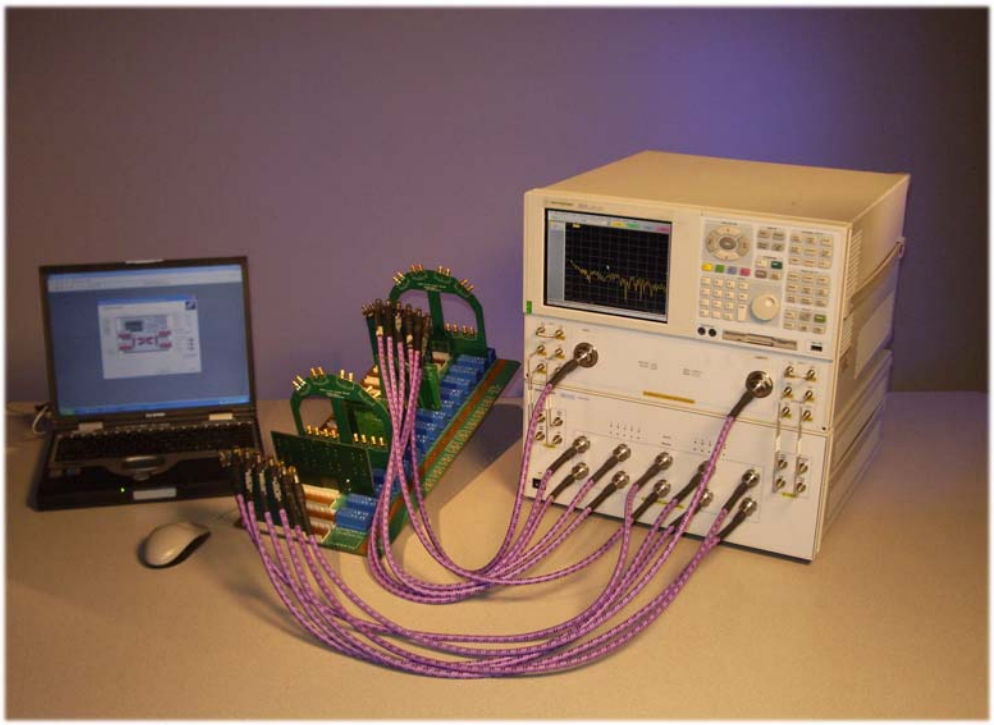
Description

The Agilent U3025AE10 is a 10-Port mechanical switching extension test set (10 MHz to 50 GHz). The 10-Port extension test set can be connected to a 12-Port device when configured with the E8364B/C Option 014 or N5230A/C Option 525 or 425 2-Port network analyzers. The U3025AE10 can be used with the E8363B/C (10 MHz to 40 GHz). The test ports are 2.4 mm male.

The test set is controlled by the test set I/O connector located on the rear panel of the PNA network analyzer.

The E8363/4B/C Performance Network Analyzer and N5230A/C PNA-L information, data sheets, white papers, or manuals can be viewed or printed by visiting http://www.agilent.com/find/pna

Figure 2 System Configuration



Network Analyzer Requirement

- All PNA, PNA-L Network Analyzers require Option 551, which adds N-Port error correction and full cross-bar measurement capability.
- PNA firmware revision:
  N5230A and E8363/4B Option 551 ≥ A.07.50.26
  N5230C and E8363/4C Option 551 ≥ A.08.04.10
- The N5230A/C PNA-L requires Option 525 or 425 (40 GHz) to provide the test set interface connections and requires test set file u302xae10_p2.tsx.
- E8363/4B/C PNA require Option 014 to provide the test set interface connections and requires test set file u302xae10_p2.tsx.

More PNA information is available on the following websites:

- Documentation - http://www.agilent.com/find/pna
- Network Analyzer Firmware - http://na.tm.agilent.com/pna/firmware/firmware.htm
- U3025AE10 Test Set Files - http://na.tm.agilent.com/multiport. (see test set files link)

Available Options

Test Set Options

The U3025AE10 has two available test set options:
Refer to "System Block Diagrams" beginning on page 58.

- Standard - Includes amplifiers.
- Option 001 provides Bias Tee's for the 10-Ports in the U3025AE10.

Accessory Options

Installation instructions are included in the option package.

- Option 1CM - Rackmount Kit (5063-9215).
- Option 1CN - Front-Handle Kit (5063-9228).
- Option 1CP - Rackmount with front handle Kit (5063-9222).

Cable Options

The U3025AE10 has one available cable option:

- Option 525 provides the cable set to connect the E8363/4B/C Option 014, N5230A/C Option 525, or Option 425.

Verifying the Shipment

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to "Contacting Agilent" on page 65. Keep the damaged shipping materials (if any) for inspection by the carrier and an Agilent Technologies representative.

Table 1 contains the accessories shipped with your U3025AE10.

Table 1 Content List

Agilent Part Number	Description	Qty
Common to the following Options		
9320-0333	Envelope-Cal Certificate	1
9320-6636	Functional Test Certificate	1
U3025-90001	User's Guide	1
8120-6818	Test Set I/O Cable	1
5023-0132	Locking Feet	1
Option 525 (12-Port Configuration, 2.4 to 2.4 mm connector)		
U3025-20044	RF Cable Semi-rigid	4
U3025-20045	RF Cable Semi-rigid	4

General Specifications

Specifications for the U3025AE10 Multiport Test Set (10 MHz to 50 GHz) are characteristic for the System performance of the PNA and Test Set. Actual performance of the system is based on the customers PNA that is used with the test set. A functional certificate is only offered for the U3025AE10.

NOTE When connected to a PNA, this test set will degrade the performance at the test ports. The internal switch paths reduce test port power and power to the receivers. This affects the test port power of the PNA and also reduces dynamic range. The reflection tracking values measured in the "Operational Check" on page 43 can be subtracted from the analyzers dynamic range to determine the approximate performance of the system.

Power Requirements

Verify that the required ac power is available at all necessary locations before installing the Test Set to the PNA.

- Air conditioning equipment (or other motor–operated equipment) should not be placed on the same ac line that powers the Test Set and PNA.
- Table 2 contains the maximum wattage for all instruments. This table can be use to determine the electrical and cooling requirements.

NOTE Values are based on 120 Vac supplied to each instrument at 60 Hz.

Table 2 Power Requirements

Standard Equipment	
Instrument	**Maximum Wattage**
E8364B/C and N5230A/C	350
U3025AE10	350
Total	700

WARNING **This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.**

Environmental Requirements

The environmental requirements of the PNA are listed in Table 3. Note that these requirements are the same as those of the E8364B/C and N5230A/C.

CAUTION Ventilation Requirements: When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, forced convection must be used.

Table 3 PNA Operating Environment

Temperature	
Operation	0 °C to 40 °C (32 °F to 104 °F)
Storage	–40 °C to +70 °C (–40 °F to +158 °F)
Measurement Calibration	20 °C to 26 °C (68 °F to 79 °F)
Performance Verification	Temperature must be within 1 °C (1.8 °F) of the temperature at which the measurement calibration was performed.
Pressure Altitude (Operation or Storage)	0 to 4600 meters (~ 15,000 feet)
Enclosure Protection	IP 2 0, according to IEC 529

Environmental Tests

The U3025AE10 complies with all applicable safety and regulatory requirements for the intended location of use and have been evaluated to assure that they are consistent with Agilent quality and reliability goals. On the basis of that evaluation, the following environmental tests have been deemed unnecessary and have not been performed: temperature, humidity, shock, vibration, altitude and power line conditions.

Equipment Heating and Cooling

If necessary, install air conditioning and heating to maintain the ambient temperature within the appropriate range. Air conditioning capacity must be consistent with the BTU ratings given in Table 2.

Required Conditions for Accuracy Enhanced Measurement

Accuracy–enhanced (error–corrected) measurements require the ambient temperature of the PNA and Test Set to be maintained within ± 1 °C of the ambient temperature at calibration.

Dimensions and Space Requirements

Standard installation of the U3025AE10 and PNA includes configuration and installation on a customer provided lab bench or table top of adequate size and strength.

Table 4 System Dimensions

Item	Weight
Required Bench Top Dimension:	
Clearance above the bench	43 cm (17 in)
Width	127 cm (50 in)
Depth	102 cm (40 in)
Weight	55 kg (110 lb)

Table 5 Instrument Dimensions

Model	Weight	Height	Width	Depth
E8364B/C	29 kg (64 lb)	26.7 cm (10.5 in)	42.5 cm (16.7 in)	42.6 cm (16.8 in)
N5230A/C	24.9 kg (55 lb, ±0.5 lb)	26.7 cm (10.5 in)	42.5 cm (16.7 in)	42.6 cm (16.8 in)
U3025AE10	12.7 kg (28 lb)	19.1 cm (7.5 in)	42.5 cm (16.7 in)	42.6 cm (16.8 in)

Frequency Range and Maximum Power Levels

The U3025AE10 frequency range is 10 MHz to 50 GHz.

CAUTION It is recommend that you do not operate components near damage levels (+30 dBm). The power levels must be 3 dB below maximum level to ensure no damage. See Table 6.

Table 6 Power Levels

Test Setup	Power Level
Maximum U3025AE10 Multiport Test Set RF Power Levels:	
PORT 3-12	+30 dBm 40 Vdc
SOURCE OUT	+30 dBm 0 Vdc
CPLR ARM	+30 dbm 7 Vdc
CPLR THRU	+30 dBm 40 Vdc
RVCR A IN and B IN[1]	+15 dBm 0 Vdc
Damage Power Levels to U3025AE10 Access and Test Ports:[2]	
Max Level to Port 1 & 2 Test Ports	+30 dBm 40 Vdc

1. Refer to your PNA specifications to determine the maximum input power levels for the access and test ports.
2. Add the RF signal to the DC component to determine the maximum wattage.

NOTE Refer to your PNA specifications to determine the maximum input power levels for the access and test ports.

The examples shown assumes a 10 dBm (0.01w) RF signal and 7 volt DC.

Equation 1 DC Wattage (E^2/R = DC Wattage)

$$7v^2/50\Omega = 0.98w$$

Equation 2 Maximum Wattage (RF + DC = Maximum Wattage)

$$0.01w + 0.98w = 0.99w$$

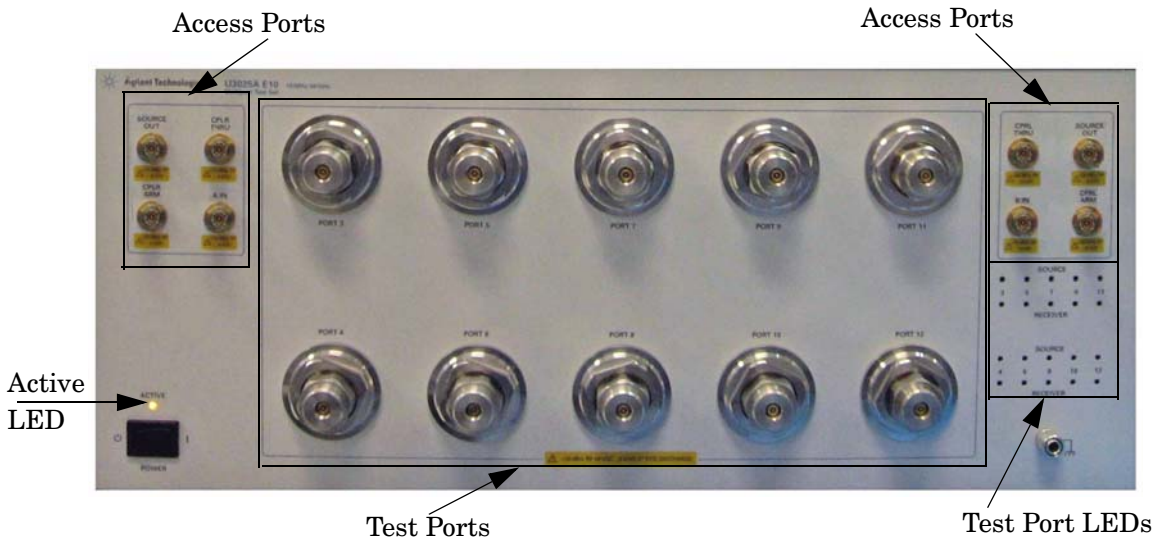
Table 7 Typical Reflection Tracking Loss[1] [2]

Frequency	Standard (dB) *(typical)*	Option 001 (dB) *(typical)*
10 MHz to 45 MHz	+3.0	2.5
45 MHz to 500 MHz	+6.5	+6.0
500 MHz to 2 GHz	+4.0	3.5
2 GHz to 10 GHz	+2.0	1.5
10 GHz to 20 GHz	0	–0.5
20 GHz to 30 GHz	–3.0	–8.0
30 GHz to 40 GHz	–4.5	–9.0
40 GHz to 45 GHz	–7.0	–10.0
45 GHz to 50 GHz	–8.5	–12.0

1. Reflection tracking loss is generally source path loss + receiver path loss.
2. Does not include margin of ±2 dB, or PNA accuracy ±1.5 dB up to 40 GHz (±2 dB 40 to 50 GHz).

Front and Rear Panel Features

Figure 3 Front Panel (Multiport Test Set)



Active LED

- When the test set power switch is On and is connected and addressed by a PNA, the LED is On (illuminated).
- The LED is Off (not illuminated) when the test set power switch is in Standby, or not addressed by a PNA.

Test Port LEDs

- An illuminated LED indicates an active port and if it is in Source or Receiver mode.
- If all of the Source or Receiver LEDs are illuminated, all of the ports are terminated.
- If all of the odd numbered ports are Off, Port 1 of the PNA is active.
- If all of the even numbered ports are Off, Port 2 of the PNA is active.

Test Ports – 2.4 mm Bulkhead (male)

- Port 3–12

Access Ports – 2.4 mm (female)

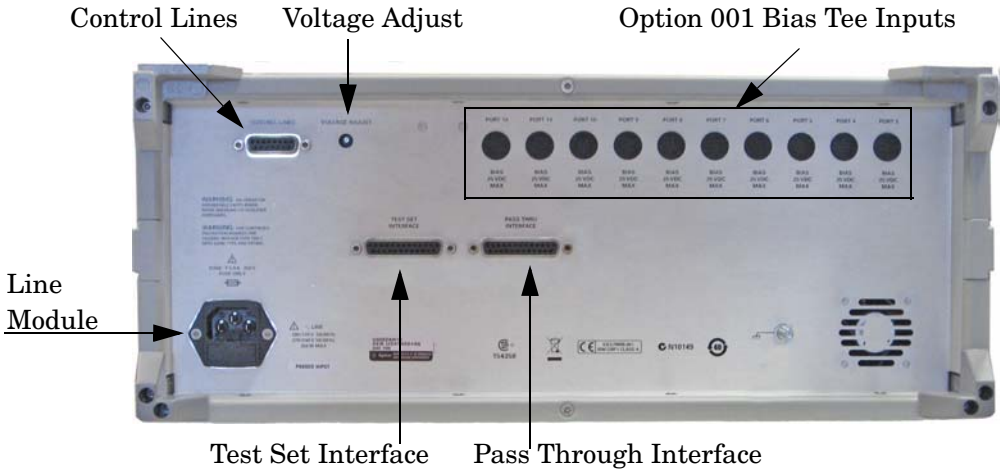
- SOURCE OUT
- CPLR THRU
- CPLR ARM
- A IN – B IN

Line Switch

⏻ – Standby

1 – ON (Active LED On)

Figure 4 Rear Panel (Multiport Test Set)



Control Lines and Voltage Adjust

For further information pertaining to control lines and voltage adjustments see "DUT Control Lines" on page 38.

Test Set Interface

The Test Set Interface connector is used to send address and data to the test set from the PNA.

Pass Through Interface

Connection to another test set.

Bias Tee Inputs - Option 001 (only)

BNC female Connectors.

Line Module

The line fuse, as well as a spare, reside within the line module. Figure 5 illustrates where the fuses are located and how to access them.

Available Fuses

- Fuse (F 5 A/250V, 2110-0709) U.L. listed and CSA certified

WARNING **For continued protection against fire hazard replace line fuse only with same type and rating:**
• F 5A/250V, Part Number 2110-0709

The use of other fuses or material is prohibited.

Figure 5 Line Fuse

CAUTION This instrument has autoranging line voltage input; be sure the supply voltage is within the specified range.

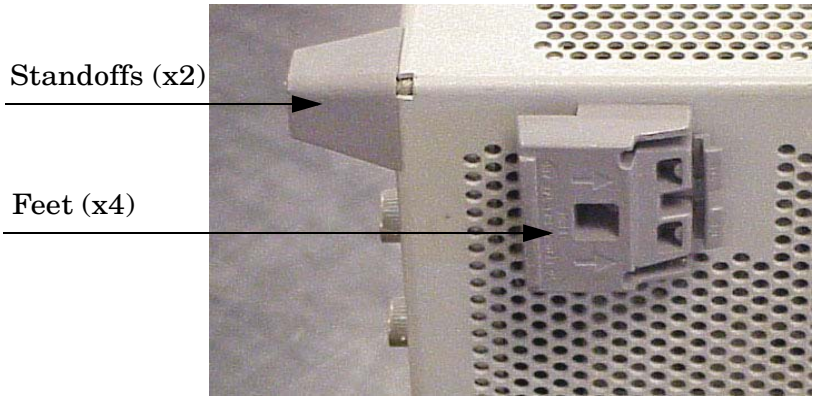
System Setup E8363B/C, E8364B/C, or N5230A/C

WARNING **The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**

Preparing the PNA Network Analyzer

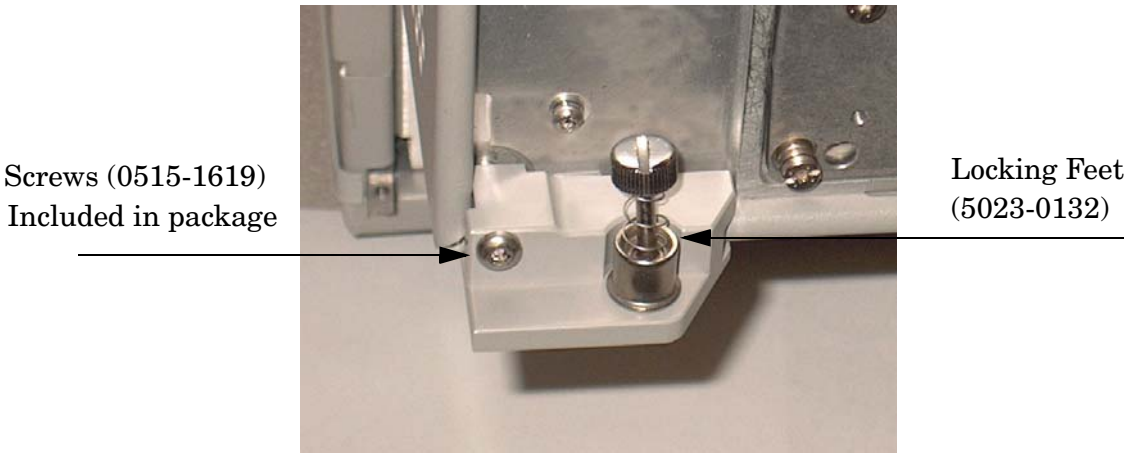
1. Remove the feet from the bottom of the network analyzer. Refer to Figure 6.
2. Remove the 2 lower standoffs and screws (0515-1619) from the rear panel on the network analyzer. Refer to Figure 6.

Figure 6 Rear Bottom Feet



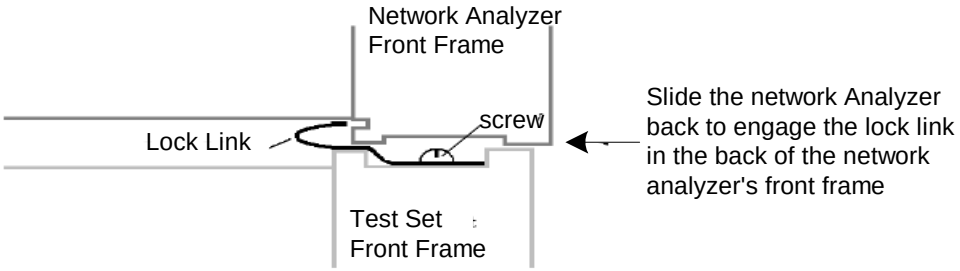
3. Install the two rear locking feet (5023-0132) using the included screws (0515-1619), where the standoffs were removed. Refer to Figure 7.

Figure 7 Install Locking Feet



4. Place the network analyzer on top of the Test Set and ensure that the front frame of the network analyzer is positioned slightly forward of the locks that are attached to the Test Set. Slide the network analyzer back so the locks engage the front frame of the analyzer. Refer to Figure 8.

Figure 8 Locking the Analyzer's



5. Secure the network analyzer's lower locking feet to the Test Set upper locking feet, using the spring–loaded screws on the locking feet. Refer to Figure 9. If the network analyzer's lower locking feet are not aligned with the screw holes in the Test Set's upper locking feet, loosen the screws securing the feet to the instrument slightly to align.

Figure 9 Locking Feet Screws

NOTE There are two Lock-Feet kits available. Refer to "Contacting Agilent" on page 65 for ordering information.

- PNA – 5023-0132 (Kit includes locking feet and screws)
- Test Set – 5063-9253 (Kit includes lock links, locking feet and screws)

12-Port RF Cable Connections

Figure 10 on page 18 illustrates the setup configuration of the U3025AE10 Multiport Test Set and how it should be configured to the E8364B/C 2-Port and N5230A/C PNA Network Analyzer.

1. Connect the RF cables supplied with this option between the network analyzer and the U3025AE10 Test Set. Torque each cable to 8 in-lb. Refer to Table 8 and Figure 10 on page 18.

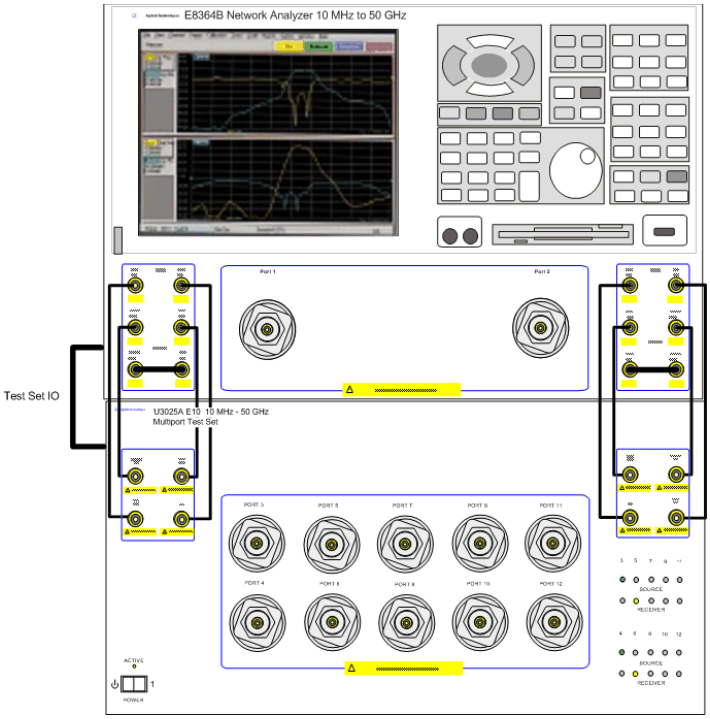
CAUTION Each end of the interconnect RF cables have a different length from the bend. When connecting the RF Interconnect cables be sure that the longer end from the bend is connected to the PNA.

CAUTION Over torque will cause damage to the test set and may cause connectors to spin or become loose.

Table 8 12-Port Cable Connection

RF Cables	From (PNA)	To (Test Set)
U3025-20044	SOURCE OUT	SOURCE OUT
U3025-20044	CPLR THRU	CPLR THRU
U3025-20045	CPLR ARM	CPLR ARM
U3025-20045	RCVR A IN, B IN	A IN, B IN

Figure 10 12-Port Setup Configuration



2. Connect the PNA Test Set I/O cable (8120-6818) to the U3025AE10 Test Set Interface on the rear panel.

Figure 11 Test Set I/0 Connections

Controlling the System with E8363/4B and N5230A

This section will describe how to setup and operate the U3025AE10 Multiport Test Set with the E8364B 2-Port PNA Network Analyzer or N5230A PNA-L.

NOTE The internal firmware of the Agilent E8363/4B/C 2-Port Network Analyzer has not been modified for this test set option. Power levels may differ from those indicated on the PNA when the Test Set is connected.

The U3025AE10 Multiport Test Set is considered a “slave” instrument. A PNA must be used to control the test set.

- PNA Multiport Mode:
  Firmware revision ≥ A.07.50.26 for E8363/4B Option 551
  Firmware revision ≥ A.07.50.26 for N5230A Option 551

  The following test set file must be installed into network analyzer file directory:
  c:\Program Files\Agilent\Network Analyzer\testsets

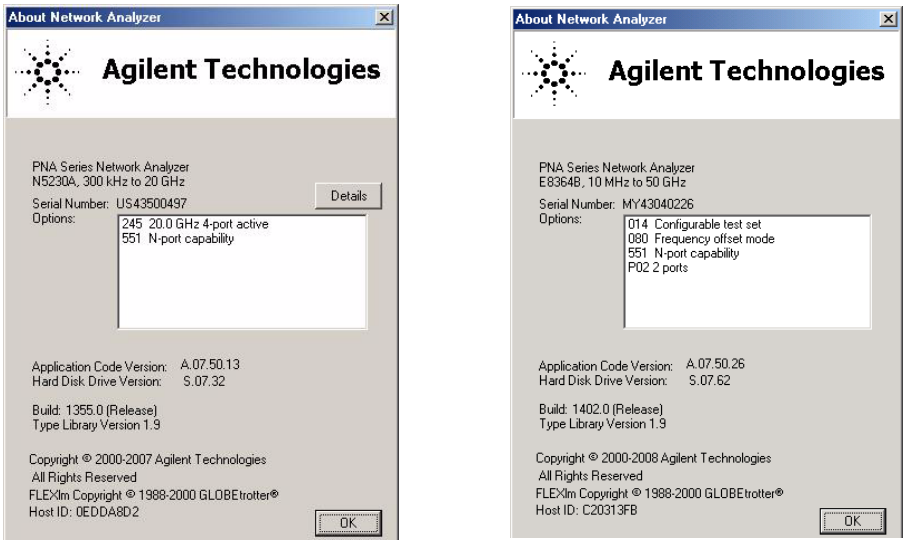
  PNA or Port PNA-L requires test set: u302xae10_p2.tsx

Visit our website for firmware revision and downloads.http://na.tm.agilent.com/pna/firmware/firmware.htm
You may also refer to “Installing New Firmware” on page 20 in this manual.

PNA Multiport Mode for E8363/4B and N5230A with Option 551

The PNA Multiport Mode selects the test set file that will enable the PNA to control the Test Set. The PNA Multiport Mode allows you to complete a N-Port calibration using the Cal Wizard application in the PNA. Refer to the PNA Help system for more information.

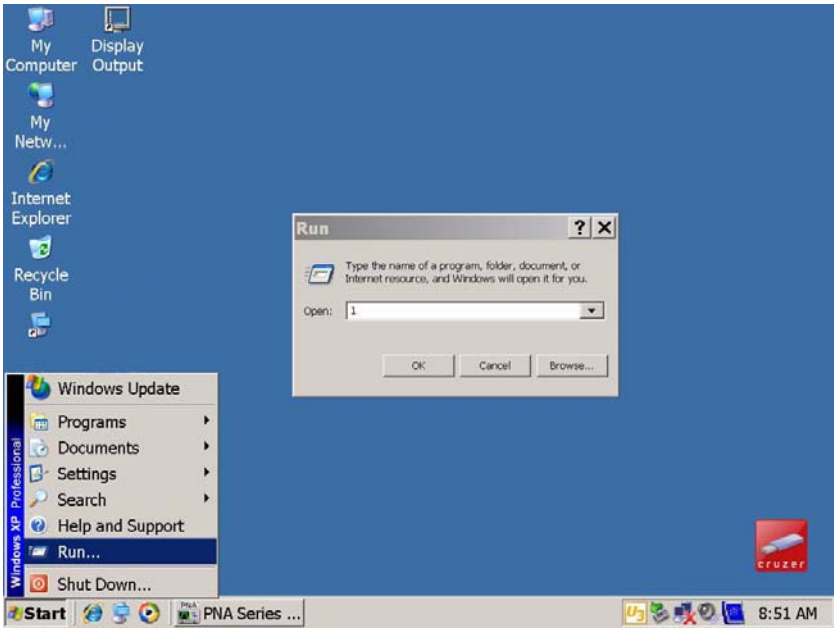
Figure 12 N5230A and E8363/4B Options



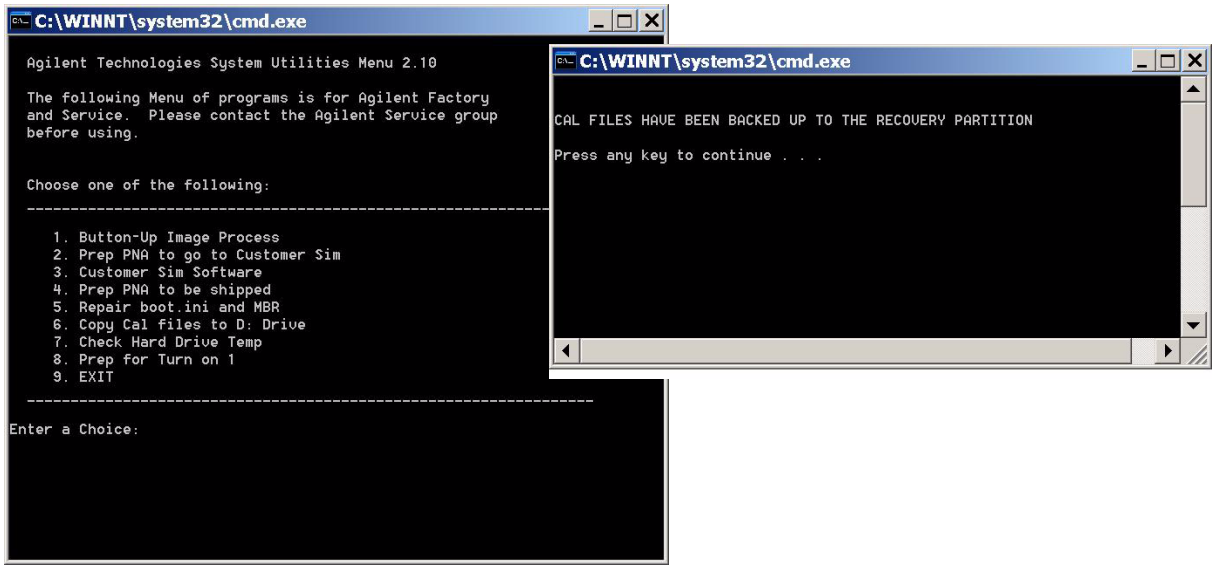
Installing New Firmware

Before installing new firmware into your PNA-L, you must store the mixer calibration files.

1. From the **Start** menu select **run** and enter **1** > **OK**.

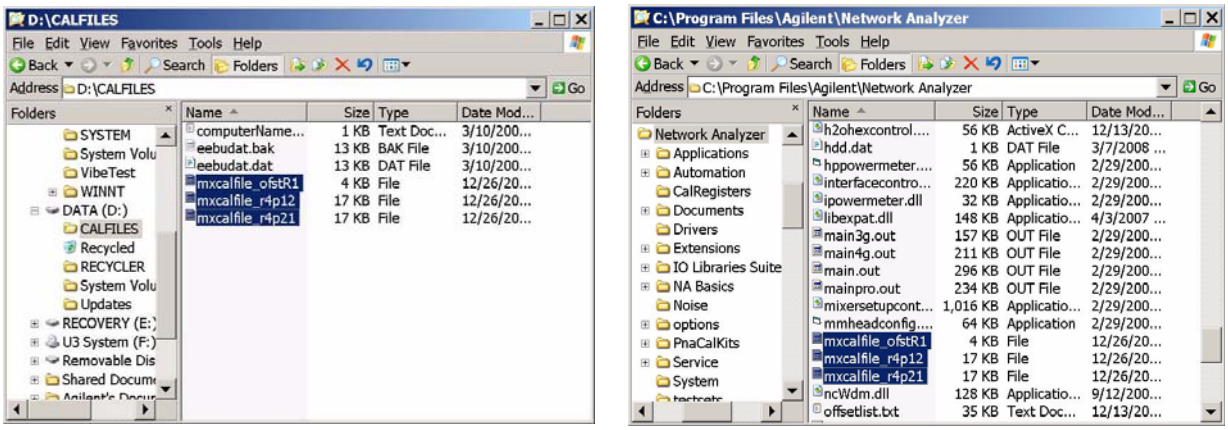


2. Command line “Enter a Choice:”, using the front panel keys enter **[6]**.
3. Command line “Press any key to continue....”, use any front panel key.


C:\WINNT\system32\cmd.exe
Agilent Technologies System Utilities Menu 2.10
The following Menu of programs is for Agilent Factory and Service. Please contact the Agilent Service group before using.
Choose one of the following:
1. Button-Up Image Process
2. Prep PNA to go to Customer Sim
3. Customer Sim Software
4. Prep PNA to be shipped
5. Repair boot.ini and MBR
6. Copy Cal files to D: Drive
7. Check Hard Drive Temp
8. Prep for Turn on 1
9. EXIT
Enter a Choice:
C:\WINNT\system32\cmd.exe
CAL FILES HAVE BEEN BACKED UP TO THE RECOVERY PARTITION
Press any key to continue . . .

4. Copy the following three mxcalfiles from D:\CALFILES to c:\Program Files\Agilent\Network Analyzer.

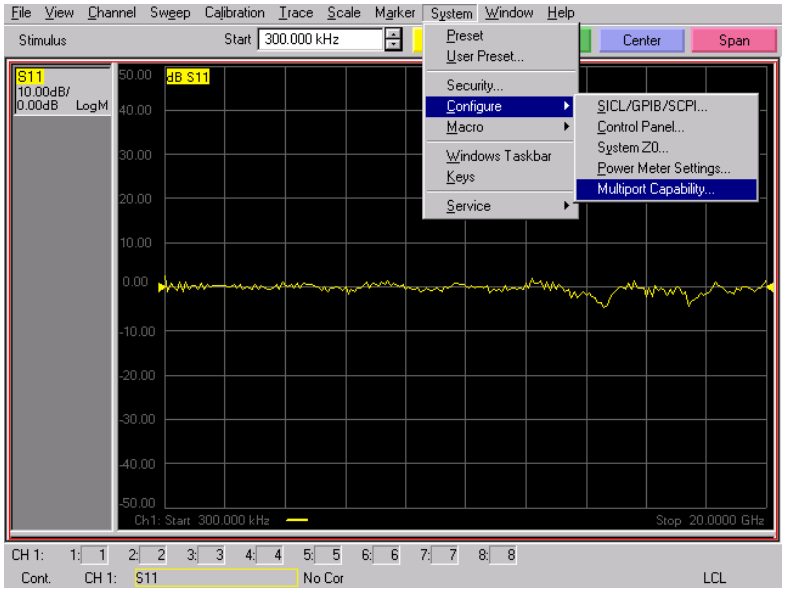
From **To**



12 Port System with E8363/4B or N5230A

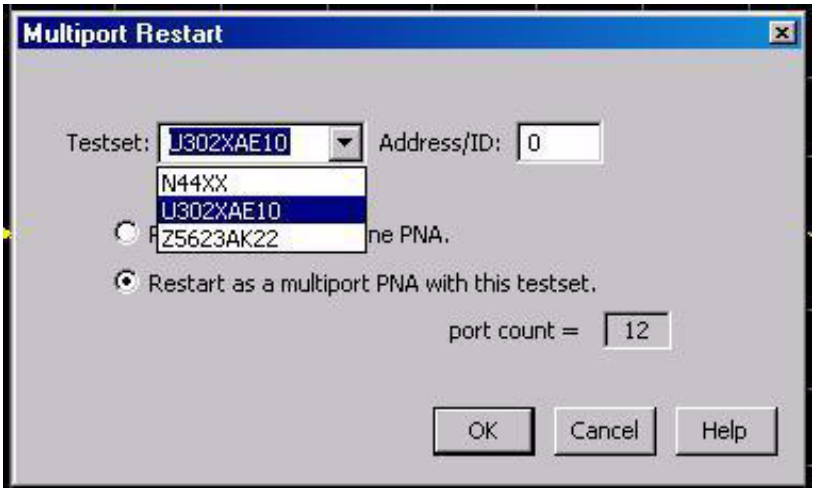
The Option 551 must be installed for Multiport capability. To access the multiport application select **System** > **Configure** > **Multiport Capability**. See Figure 13.

Figure 13 System Configuration



Select **U302xAE10** (12-Port System) from the test set drop-down menu and select **Restart as a Multiport PNA with this test set**. Press OK. The PNA will restart the network application with the U302xAE10 Multiport Test Set interface features. See Figure 14.

Figure 14 U302xAE10 Selection



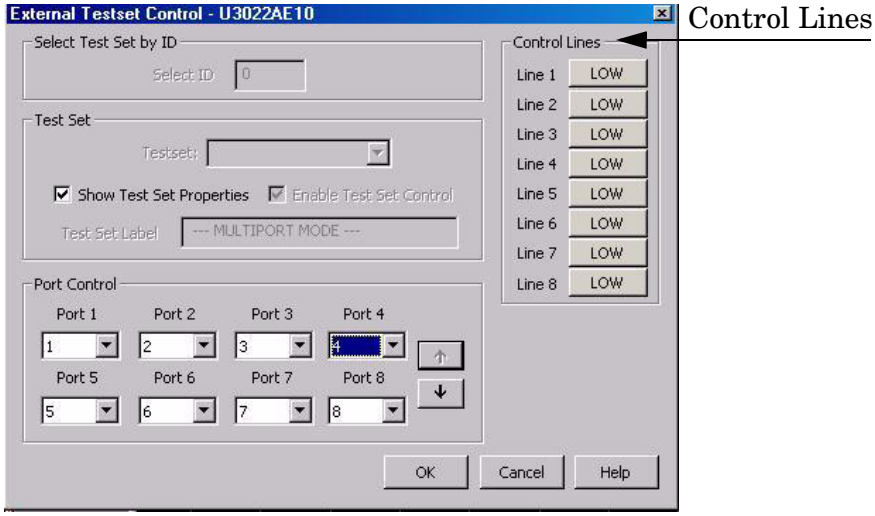
External Test Set Control Feature

To verify that the network application has the U302xAE10 interface features, select **Channel > External Test Set > Other**. The U302xAE10 will be displayed as **External Test Set Control-U302xAE10**. See Figure 15 or Figure 16. The U3022AE10 test set file can be used for the U3025AE10 file.

This menu will allow the physical Ports 1 through 12 to be identified as any port for your convenience. For example; Port 5 can be named Port 2.

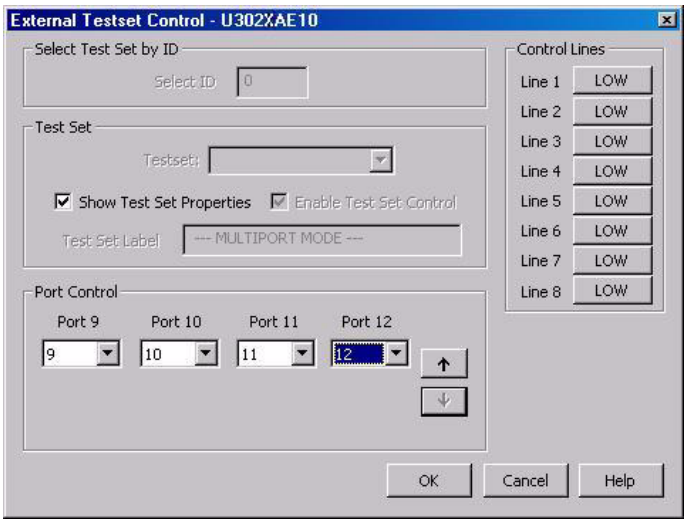
The **External Test Set Control-U302xAE10** also allows control of the DUT control lines, refer to "DUT Control Lines" on page 38. To change the state from LOW to HIGH, select the graphical user interface (GUI) for the specific control (LINE 1 through 8) and then press OK. Each line can be controlled separately, see Figure 15.

Figure 15 External Test Set U302xAE10 (Port 1 - 8)



Select the **Port Control** down arrow for Ports 9 through 12, see Figure 16.

Figure 16 External Test Set U302xAE10 (Port 9 - 12)



Trace Measure S-Parameter

S-Parameter selection can be accomplished using Trace Measure menu. Select TRACE > Measure. Use the drop-down menus to select 1 of 144 S-Parameters for the 12-Port system, see Figure 17. The first number in the Sxx selection is the Receiver Port and the second number will be the Source Port. Any port can be selected to be the Receiver, Source or both, as in S11. The front panel R LED indicates the port is the Receiver and the S LED indicates the port is the Source.

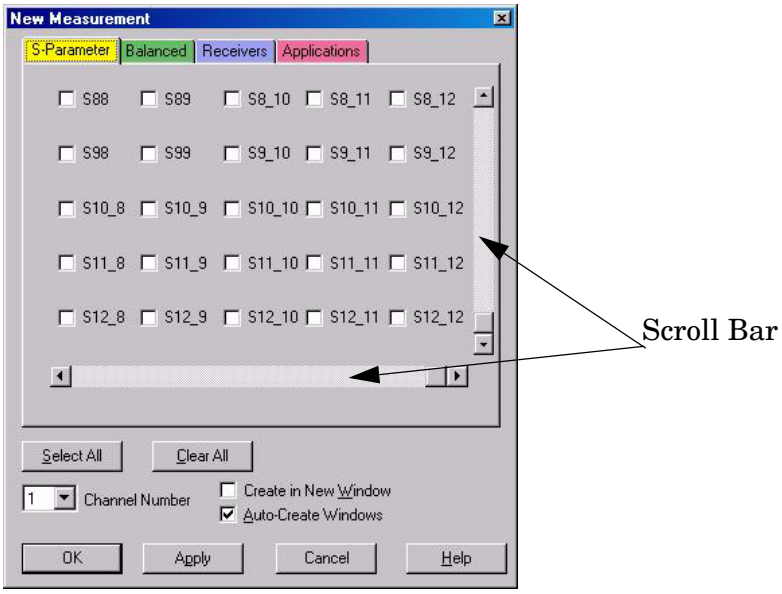
Figure 17 12-Port Trace Measure

New Trace Measure S-Parameter

S-Parameter Tab: Multiple S-Parameters can be made from the **New Measurement** menu. In the drop-down menu select **Trace** > **New Trace**. The **New Measurement** window allows the selection of any of the 144 S-Parameter's. SeeFigure 18 and Figure 19.

Figure 18 12-Port New Trace Measure (S11 - S88)

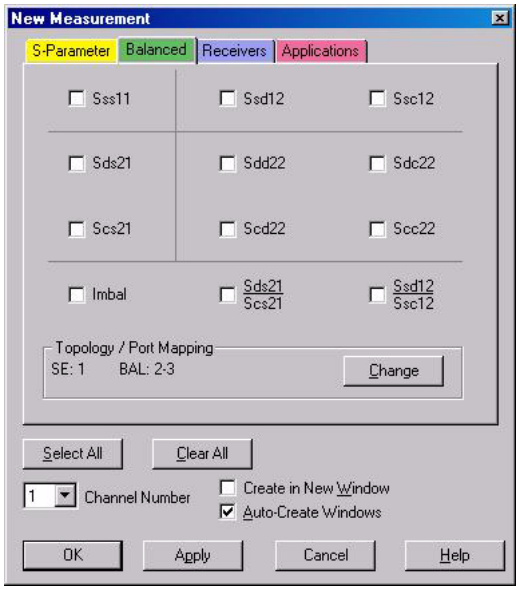
Figure 19 12-Port New Trace Measure (S88 - S12_12)



Balanced Tab: Balanced Measurements can be configured by selecting the Balance tab in the **New Measurement** menu. Refer to Figure 20.

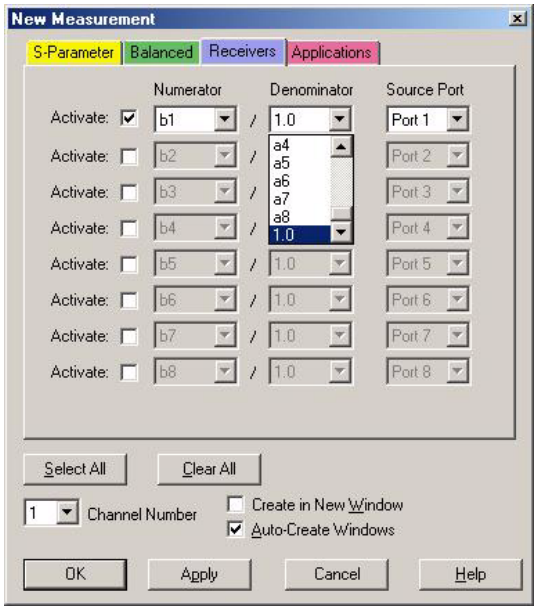
For more information on balanced (differential) component measurement, refer to the Application Note 1373-1 and 1373-2 (5988-5634EN and 5988-5635EN) at http://www.home.agilent.com. In the search menu type "**Multiport** and **Balanced**."

Figure 20 Balance



Receiver Tab: The S-Parameter measurements can be ratioed with selectable Denominators for each port and receiver. Refer to the standard PNA documentation for more information.

Figure 21 Receiver Ports



N-Port Calibration with E8363/4B and N5230A

It is recommended that you perform an ECal characterization to minimize the connections required for multiple port calibration. The N4693A Option M0F is recommended with cable (85133F) if you are calibrating at the PNA and test set ports.

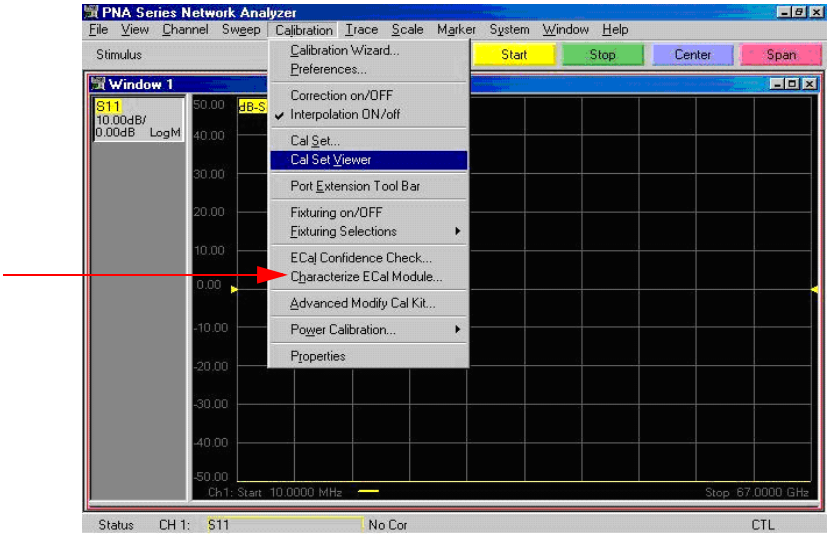
Characterize the ECal module with adapters that will not be used in the measurement of the DUT.

Calibrate at the end of the test port RF cables and any adapters that are used to connect the DUT. This removes the effect on the measurement of the DUT. Failure to do this will create ripple and other measurement errors.

NOTE If measurement errors occur, ensure the newest version of firmware is installed on the PNA. Measurement errors can be a result of firmware algorithms. Consult with Agilent Service or firmware web page for the latest PNA, PNA-L or PNA-X Option 551 firmware revisions and history. http:\\na.tm.agilent.compna\firmware\firmware.htm.

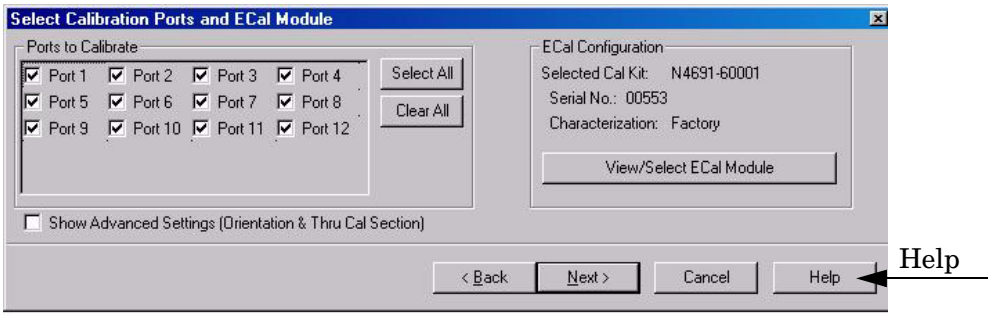
1. On the network analyzer select **Calibration** > **Calibration Wizard**.
   a. If using a mechanical cal kit, select **SmartCal**.
   b. If using an ECal module, select **ECal**.

Figure 22 ECal Characterization



2. Continue following the Cal Wizard prompts. On the “Select Calibration Ports and ECal Module” window, press **Select All** or select the ports you are calibrating and press **Next**.

Figure 23 12-Port Calibration



3. Connect the ECal or the mechanical cal kit to the ports you are calibrating following the Cal Wizard prompts and press **Measure** after each connection.
4. At the Calibration Completed prompt, select **Save As User Calset** and type the name desired. Press **Save.**
5. After calibrating test set ports, use a quality load and short to verify the calibration on each port or end of the test cable. Measure reflection and confirm the return loss is as expected. If the result is not as expected, repeat the calibration without the test set and ensure that the PNA is in standard (non-multiport) mode.

Controlling the System with E8363/4C and N5230C

This section will describe how to setup and operate the U3025AE10 Multiport Test Set with the E8363/4C and N5230C 2-Port PNA Network Analyzer.

The U3025AE10 Multiport Test Set is considered a “slave” instrument. A E8363/4C or N5230C must be used to control the Test Set.

- PNA Multiport Mode Option 551 requires firmware revision ≥ A.08.04.10. From the PNA drop-down menu select **Help** > **About Network Analyzer** to see the options installed and the installed firmware revision. See Figure 24.

  The following test set file must be installed into network analyzer file directory:
  c:\Program Files\Agilent\Network Analyzer\testsets

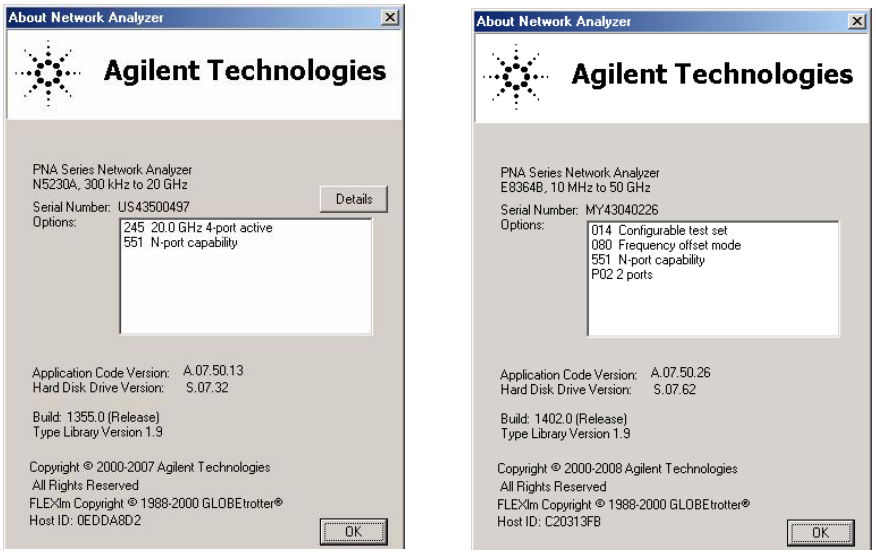
  2-Port PNA-X requires test set: u302xae10_pnax_p2.tsx
  2-Port PNA or PNA-L requires test set: u302xae10_p2.tsx

Visit our website for firmware revision and downloads.http://na.tm.agilent.com/pna/firmware/firmware.htm
You may also refer to “Installing New Firmware” on page 20 in this manual.

PNA Multiport Mode with Option 551

The PNA Multiport Mode selects the test set file that will enable the PNA to control the Test Set. The PNA Multiport Mode allows you to complete a N-Port calibration using the Cal Wizard application in the PNA. Refer to the PNA Help system for more information.

Figure 24 N5230C and E8363/4C Options



NOTE The internal firmware of the Agilent E8363/4C and N5230C has not been modified for this test set option. Power levels may differ from those indicated on the PNA when the Test Set is connected.

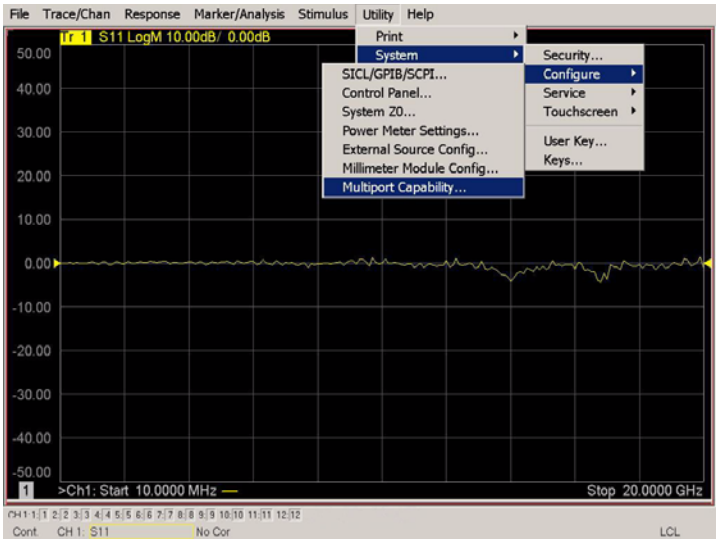
PNA Multiport Mode with Option 551

The PNA Multiport Mode selects the test set file that will enable the PNA to control the test set. The PNA Multiport Mode allows you to complete a N-Port calibration using the Cal Wizard application in the PNA. Refer to the PNA Help system for more information.

12-Port System with E8363/4C and N5230C

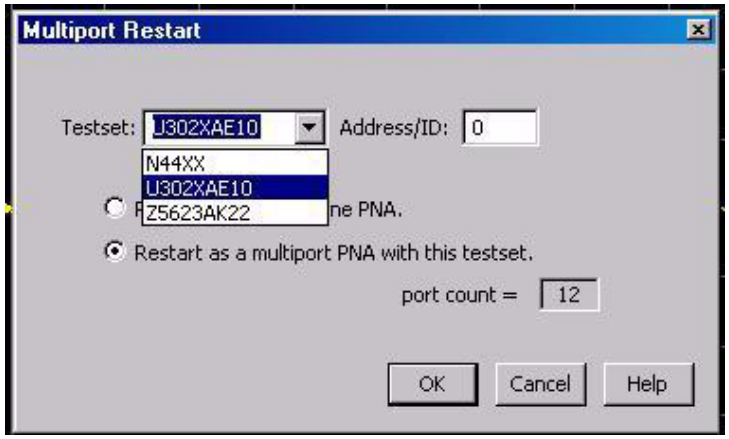
The E8363/4C and N5230C Option 551 must be installed for Multiport capability. You may access the multiport application by using the touch screen. Select **Utility > System > Configure > Multiport Capability**, or use the front panel and select **[System] > Configure > Multiport Capability**.

Figure 25 System Configuration



Select **U3025AE10** from the test set drop-down menu and select **Restart as a Multiport PNA with this test set**. Press **OK**. The PNA will restart the network application with the U3025AE10 Multiport Test Set interface features.

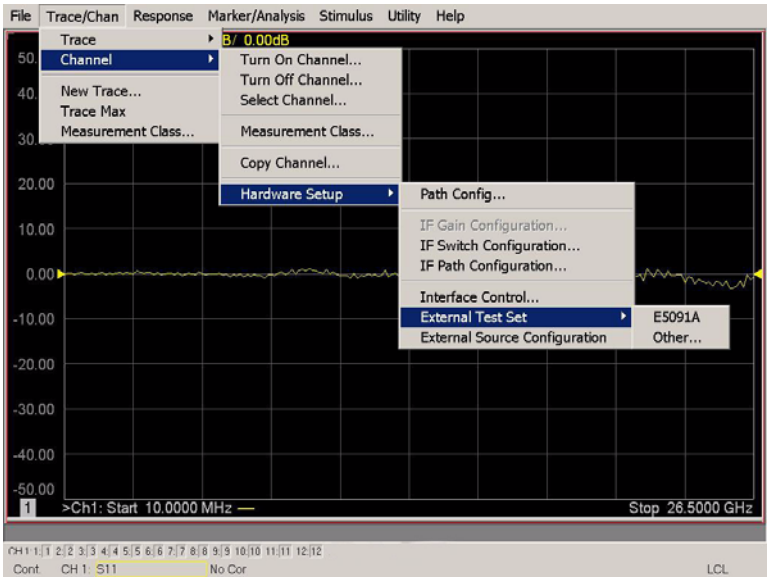
Figure 26 U3025AE10 Selection



External Test Set Control Feature

To verify that the network application has the U3025AE10 interface features, select **Channel** > **External Test Set** > **Other**. The U3025AE10 will be displayed as **External Test Set Control-U3025AE10 (**U302xAE10 or U3022AE10**)**.

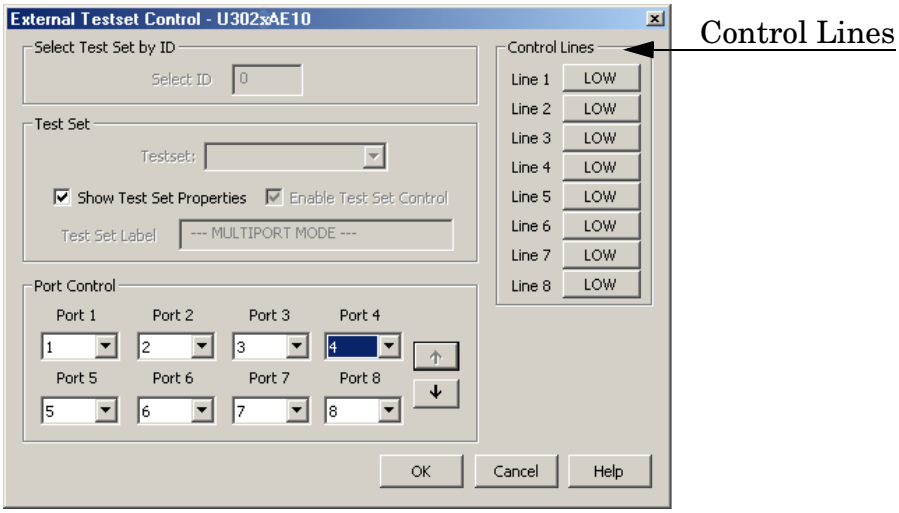
Figure 27 External Test Set Control



This menu will allow the physical Ports 1 through 12 to be identified as any port for your convenience. For example; Port 5 can be named Port 2.

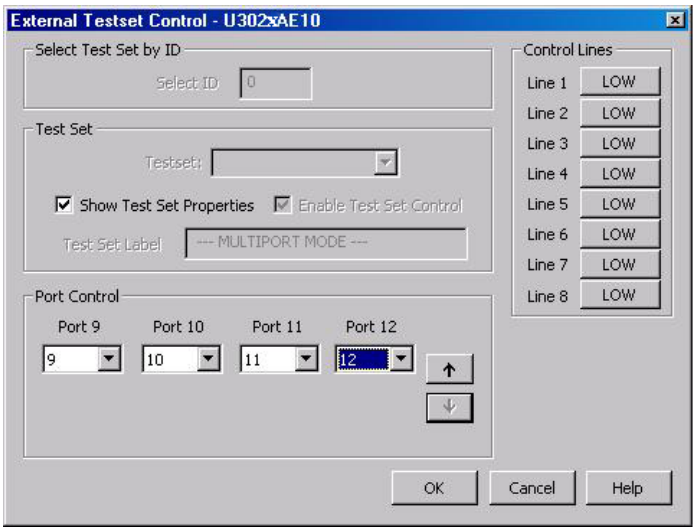
The **External Test Set Control-U3025AE10** also allows control of the DUT control lines, refer to "DUT Control Lines" on page 38. To change the state from LOW to HIGH, select the graphical user interface (GUI) for the specific control (LINE 1 through 8) and then press **OK**. Each line can be controlled separately, see Figure 28.

Figure 28 External Test Set U3025AE10 (Port 1 - 8)



Select the **Port Control** down arrow for Ports 9 through 12.

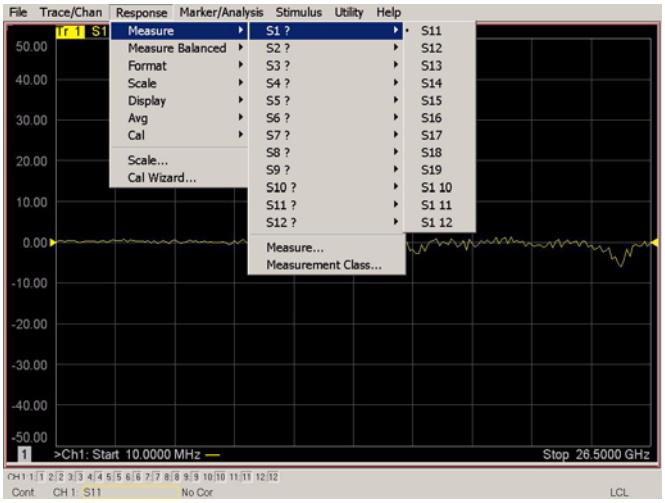
Figure 29 External Test Set U3025AE10 (Port 9 - 12)



Trace Measure S-Parameter

S-Parameter selection can be accomplished using **Response Measure** menu. Select **TRACE > Measure**. Use the drop-down menus to select 1 of 144 S-Parameters for the 12-Port system, see Figure 30. The first number in the Sxx selection is the Receiver Port and the second number will be the Source Port. Any port can be selected to be the Receiver, Source or both, as in S11. The front panel R LED indicates the port is the Receiver and the S LED indicates the port is the Source.

Figure 30 12-Port Trace Measure



New Trace Measure S-Parameter

S-Parameter Tab: Multiple S-Parameters can be made from the **New Measurement** menu. In the drop-down menu select **Trace > New Trace**. The **New Measurement** window allows the selection of any of the 144 S-Parameter's. See Figure 31 and Figure 32 on page 34.

Figure 31 Selecting PNA New Trace Measure

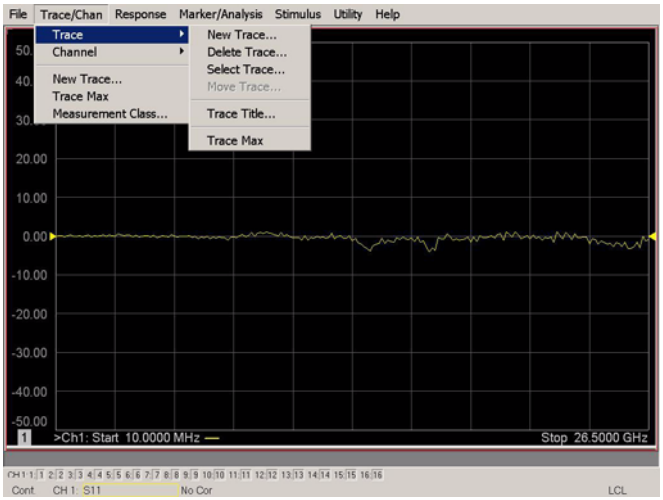
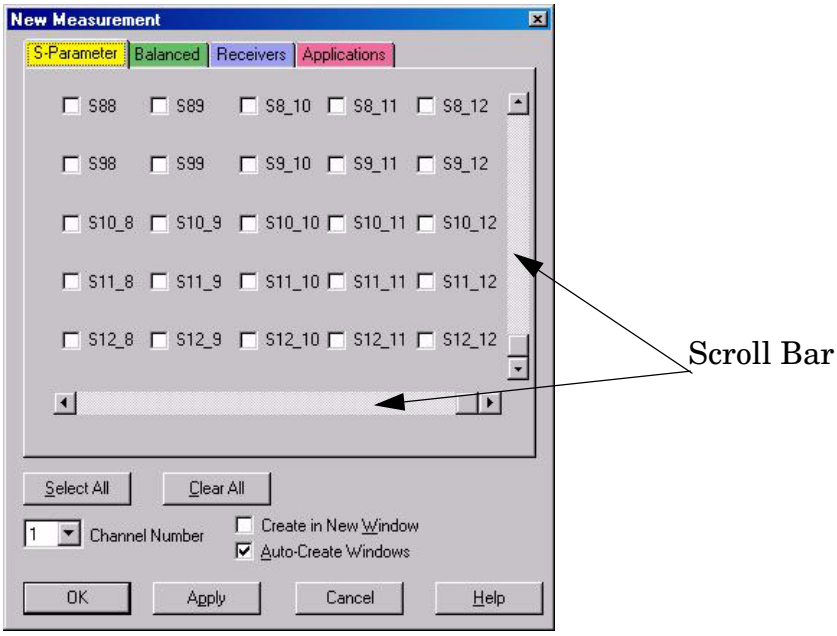


Figure 32 12-Port New Trace Measure (S11 - S88)

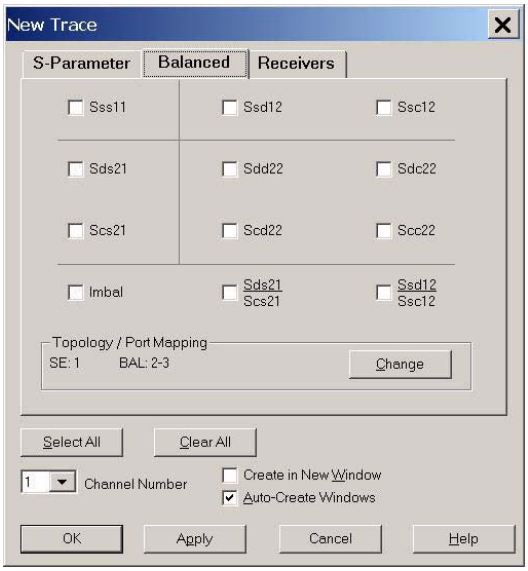
Figure 33 12-Port New Trace Measure (S88 - S12_12)



Balanced Tab: Balanced Measurements can be configured by selecting the Balance tab in the **New Measurement** menu.

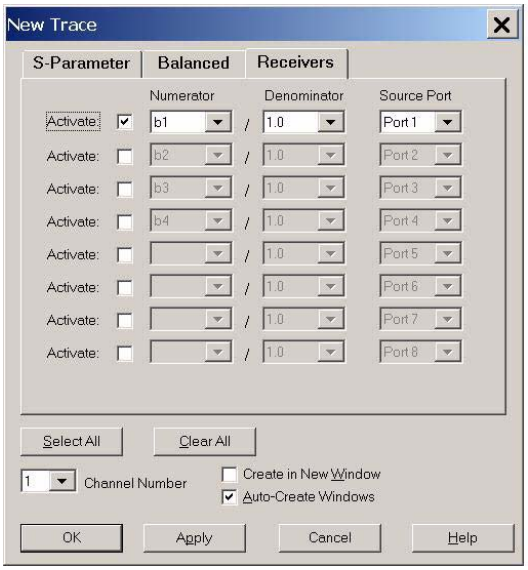
For more information on balanced (differential) component measurement, refer to the Application Note 1373-1 and 1373-2 (5988-5634EN and 5988-5635EN) at http://www.home.agilent.com. In the search menu type in “Multiport and Balanced.”

Figure 34 Balance



Receiver Tab: The S-Parameter measurements can be ratioed with selectable Denominators for each port and receiver. Refer to the standard PNA-X documentation for more information.

Figure 35 Receiver Ports



N-Port Calibration with E8363/4C and N5230C

It is recommended that you perform an ECal characterization to minimize the connections required for multiple port calibration. The N4693A Option M0F is recommended with cable (85133F) if you are calibrating at the PNA and test set ports.

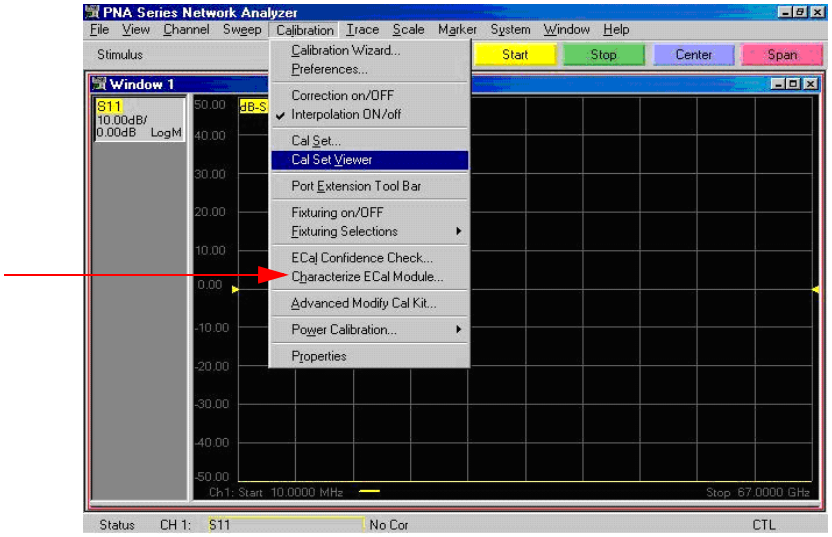
Characterize the ECal module with adapters that will not be used in the measurement of the DUT.

Calibrate at the end of the test port RF cables and any adapters that are used to connect the DUT. This removes the effect on the measurement of the DUT. Failure to do this will create ripple and other measurement errors.

NOTE If measurement errors occur, ensure the newest version of firmware is installed on the PNA. Measurement errors can be a result of firmware algorithms. Consult with Agilent Service or firmware web page for the latest PNA, PNA-L or PNA-X Option 551 firmware revisions and history. http:\\na.tm.agilent.compna\firmware\firmware.htm.

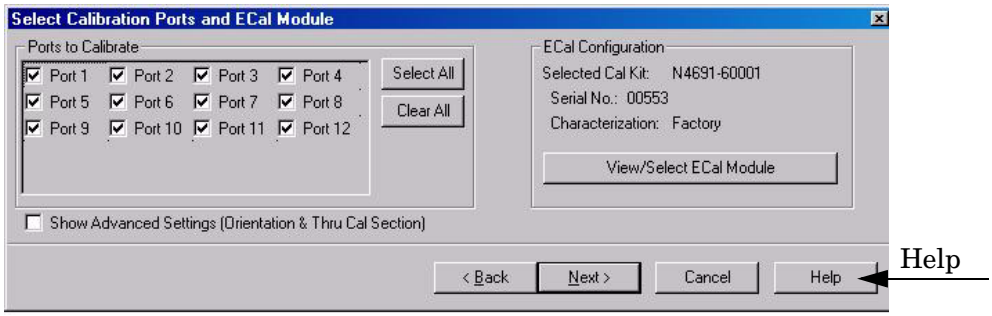
1. On the network analyzer select **Response** > **Calibration Wizard**.
   a. If using a mechanical cal kit, select **SmartCal**.
   b. If using an ECal module, select **ECal**.

Figure 36 ECal Characterization



2. Continue following the Cal Wizard prompts. On the “Select Calibration Ports and ECal Module” window, press **Select All** or select the ports you are calibrating and press **Next**.

Figure 37 12-Port Calibration



3. Connect the ECal or the mechanical cal kit to the ports you are calibrating following the Cal Wizard prompts and press **Measure** after each connection.
4. At the Calibration Completed prompt, select **Save As User Calset** and type the name desired. Press **Save.**
5. After calibrating test set ports, use a quality load and short to verify the calibration on each port or end of the test cable. Measure reflection and confirm the return loss is as expected. If the result is not as expected, repeat the calibration without the test set and ensure that the PNA is in standard (non-multiport) mode.

DUT Control Lines

The 15 pin female D-Sub connector on the rear panel provides 8 latched data connections that can be used to control your DUT. An adjustable voltage source (+2 to +5 Vdc) is provided on the front panel. A positive or negative external source can be used. Refer to Table 11 and Figure 41 on page 42.

Setting the DUT Control Interface

This section describes how to control the DUT control lines. Refer to "Controlling the System with E8363/4B and N5230A",or "Controlling the System with E8363/4C and N5230C". For more information regarding the control lines, see Table 9 on page 38 and Table 10 on page 39.

Table 9 Test Set DUT Control Address and Data

Address	**Data**	**Data AD12–AD0**	**Description**						**Bit Data 0= +Voltage 1= –Voltage**	
112	0	0000000000000	ALL DUT Control Lines set to 0 or + voltage							
112	255	0000001111111	ALL DUT Control Lines set to 0 or – voltage							
112	1	00000xxxxxxxB	DUT Control Line 1						0,1	
112	2	00000xxxxxxBx	DUT Control Line 2						0,1	
112	4	00000xxxxxBxx	DUT Control Line 3						0,1	
112	8	00000xxxxBxxx	DUT Control Line 4						0,1	
112	16	00000xxxBxxxx	DUT Control Line 5						0,1	
112	32	00000xxBxxxxx	DUT Control Line 6						0,1	
112	64	00000xBxxxxxx	DUT Control Line 7						0,1	
112	128	00000Bxxxxxxx	DUT Control Line 8						0,1	
Control Lines			Line 8	Line 7	Line 6	Line 5	Line 4	Line 3	Line 2	Line 1
Test Set I/O Bits			AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
Bit Decimal Equivalent			128	64	32	16	8	4	2	1
Example 1 Data = 0			0	0	0	0	0	0	0	0
Example 2 Data = 21			0	0	0	1	0	1	0	1
X indicates unknown user bit state										
B indicates bit of interest										
To select a test set DUT control line configuration, all 8 DUT control lines must be set. To do this you must add AD7 to AD0 binary number and convert this to a decimal equivalent.										

NOTE All DUT control lines must be set with each command sent. Logic 0 = high

Figure 38 DUT Control Line Pin Assignment

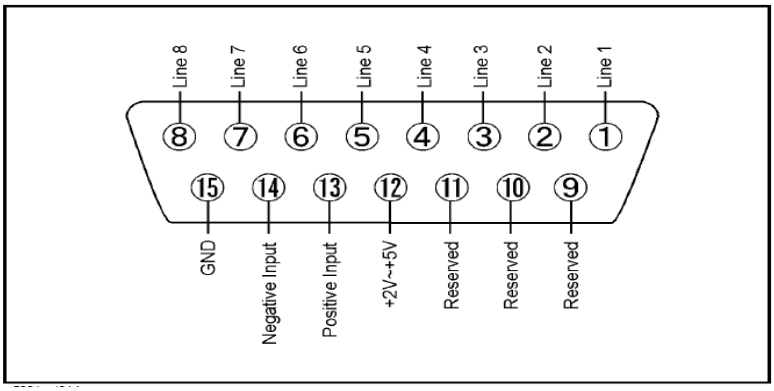


Table 10 DUT Control Line Pin Assignment

Pin Number	Signal Name	Description
1	Line 1	Output port of line 1
2	Line 2	Output port of line 2
3	Line 3	Output port of line 3
4	Line 4	Output port of line 4
5	Line 5	Output port of line 5
6	Line 6	Output port of line 6
7	Line 7	Output port of line 7
8	Line 8	Output port of line 8
9		Not used
10		Not used
11		Not used
12	+2 V to +5 V	The voltage input to pin 13. (The voltage can be varied by rotating the voltage adjustment trimmer on the front panel).
13	Positive Input	Input a signal that is outputted when each line is high from pin 12 or external dc power supply.
14	Negative Input	Input a signal that is outputted when each line is low from the external dc power supply. Able to output 0 V as low from the each line by connecting to pin 15.
15	Gnd	ground terminal

Setting the Variable Source Voltage

The output voltage of pin 12 can be varied from +2 to +5 V. Perform the following procedure to set the voltage:

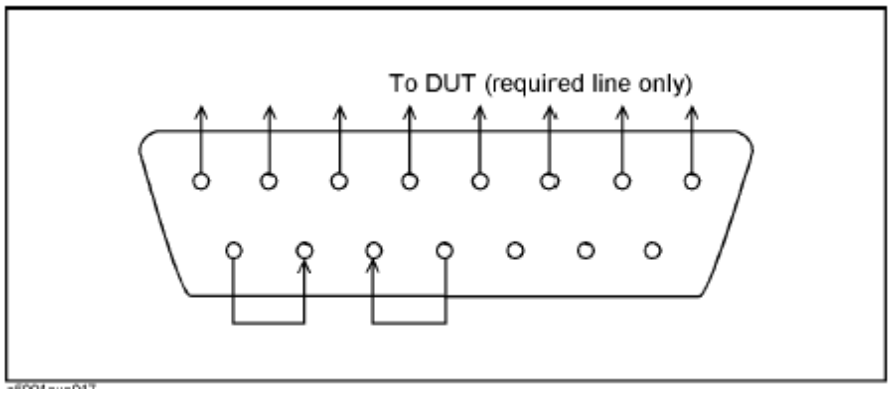
1. Turn On U3025AE10.
2. Measure the voltage between pin 12 and 15 using a multimeter.
3. Rotate the voltage adjustment trimmer on the front panel until the multimeter indicates the appropriate voltage.

Connecting to the DUT Control Lines

Figure 39 illustrates an example of the connection between the DUT and the U3025AE10 *without* an external dc power supply. Connect pin 12 to pin 13 for +5 V, and pin 14 to pin 15 to provide the ground path. Connect each DUT control line to the external device under test.

CAUTION You may only connect pin 12–13, and pin 14–15. Damage may result if any other path is short–circuited.

Figure 39 Control Line Connector



Using an External Power Supply

Figure 39 illustrates an example of the connection between the DUT and the U3025AE10 *with* an external dc power supply. Input the High and Low signals from the external power supply to the Positive Input and Negative Input respectively, and connect each line to the control terminal of the DUT.

Turning On the U3025AE10 using an External Power Supply.

1. Turning On the U3025AE10.
2. Connect the DUT.
3. Turn On the external power supply.

Turning Off the U3025AE10 using an External Power Supply.

1. Turning Off the Power Supply.
2. Turning Off the U3025AE10.
3. Disconnect the DUT.

Figure 40 U3025AE10 to the DUT and External DC Power Supply

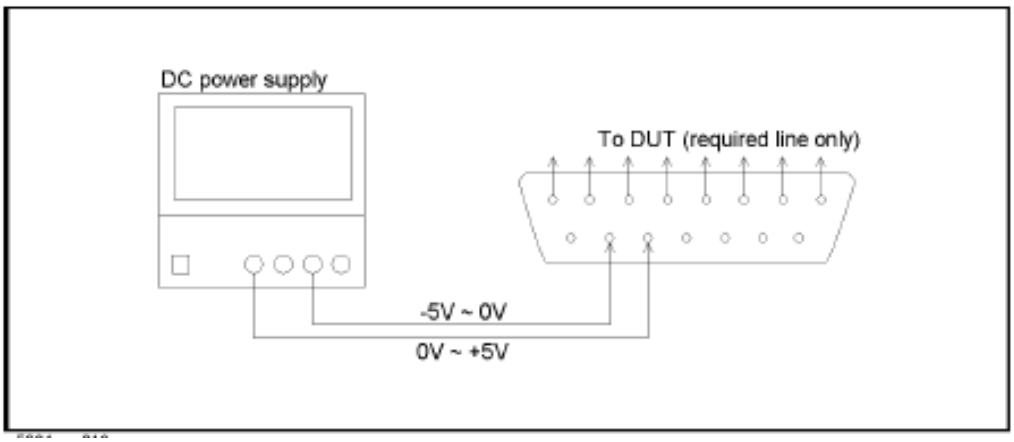
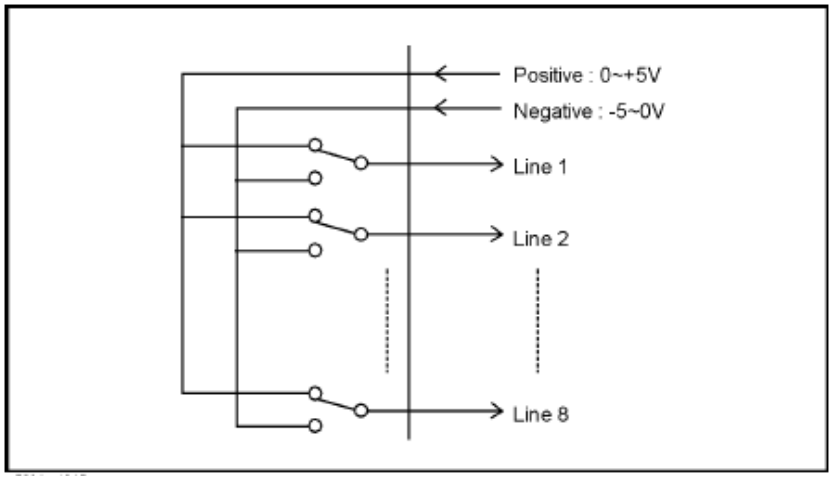


Table 11 DUT Control Specifications

Item	Specifications
Connector Shape	15–pin female D–Sub
Voltage Range:	
Positive Input	0 to +5 V
Negative Input	–5 to 0 V
Maximum Current	100 mA (in total of each line)
Impedance	< 10 Ω
Range of Variable Voltage	+2 to +5 V

Figure 41 Block Diagram of DUT Control



Operational Check

This section provides the test calibration procedure to confirm the U3025AE10 and PNA operational performance. The operation verification limits provided ensure that your U3025AE10 and PNA are operating properly.

Verification Limits

Specifications for the U3025AE10 Multiport Test Set are typical. System performance for the PNA and Test Set are only characteristic and intended as non warranted information. A functional certificate is provided for the U3025AE10 only.

It is recommended that you return your instrument to Agilent Technologies for servicing or repair if the Test Set and PNA performance exceed the operational verification limits.

NOTE Typical specifications are based on 1 to 2 units performance.

Table 12 Operational Check Reflection Tracking Loss

Frequency	Standard (dB)	Option 001 (dB)
10 MHz to 45 MHz	–0.5	–1.0
45 MHz to 500 MHz	+3.0	2.5
500 MHz to 2 GHz	+0.5	0
2 GHz to 10 GHz	–1.5	–2.0
10 GHz to 20 GHz	–3.5	–4.0
20 GHz to 30 GHz	–6.5	–11.5
30 GHz to 40 GHz	–8	–12.5
40 GHz to 45 GHz	–10.5	–14.0
45 GHz to 50 GHz	–12.5	–16.0

NOTE If you suspect that your 12-Port configuration is not operating properly, ensure that all front RF jumper interconnect cables are correctly attached.

Equipment Required

The Agilent U3025AE10 requires that the user be familiar with the equipment and components listed in Table 13.

This section provides an equipment list and setup of the PNA and Test Set.

Table 13 Equipment List

Description	Qty
E8364B/C 2-Port Network Analyzer (Option 014 or 551) *or* N5230A/C 2-Port Network Analyzer (Option 525 or 551)	1
N4693A ECal Module with a female connector, or a 2.4 mm Cal kit (85056B, 85057D, etc.)	1
Set of interconnect cables (PNA and Test Set), see "12-Port RF Cable Connections" on page 17.	1

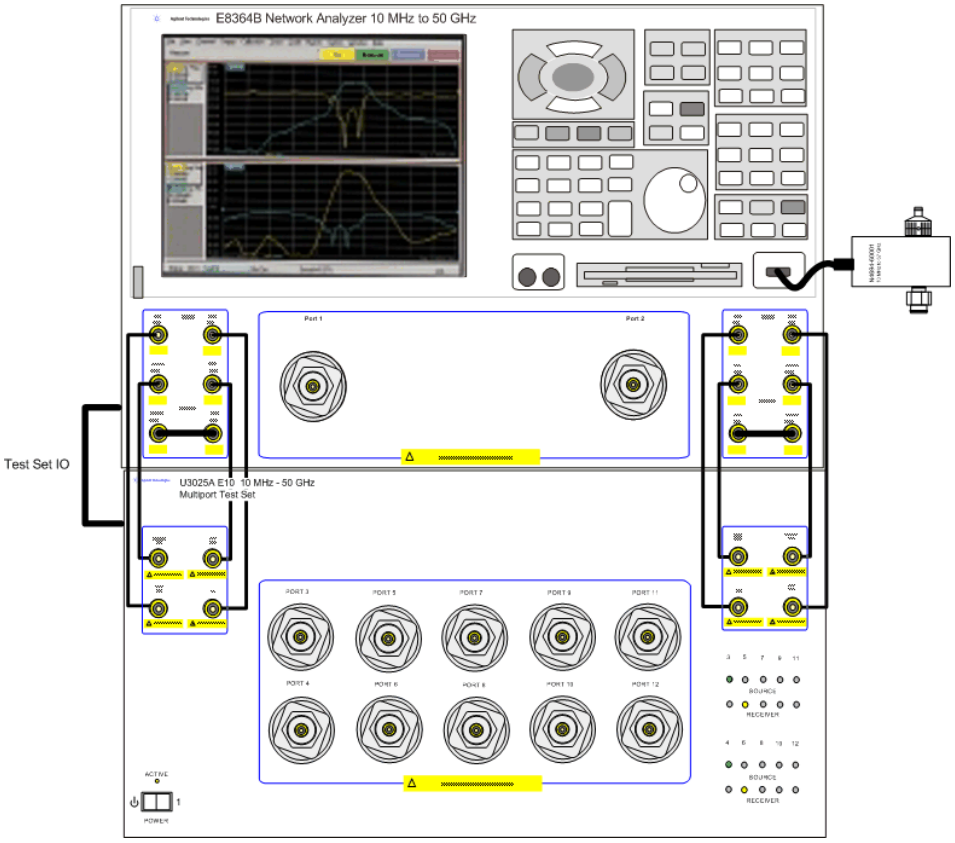
Operational Check Procedure with E8363/4B or N5230A

The sequence of this procedure is very important and must be followed or the performance accuracy and results may vary from the reference plots provided.

Prepare the PNA

1. Connect the Test Set to the E836/34B or N5230A using the interconnect cables as shown in Figure 10 on page 18 and Table 8 on page 17.
2. On the PNA, press **Calibration** > **Cal Sets**. Delete or Rename any Cal Sets titled “999.1” thru “999.12” (12-Port), although it is unlikely that you will find Cal Sets with these names.
3. Verify that the PNA is in 12-Port mode by selecting **Trace** > **New Trace**.
   a. If only four S-Parameters are listed, press **System** > **Configure** > **Multiport Capability**. On the Multiport Restart dialog, select **Restart as multiport PNA with this test set**. Select **U3025AE10** (12-Port).
4. Press **System** > **Preset**.
5. Verify that the **[Stop Frequency]** is set to the maximum of the PNA and test set.
6. Verify that the **[Start Frequency]** is set to **[10 MHz]**. If not, press **Channel** > **Start/Stop** and enter **[10 MHz].**
7. Verify that the **[Power]** is to set to **[–17 dBm]**. If not, press **[Power]** > **Power Level** and enter **[–17 dBm].**
8. Select **Sweep** > **IF Bandwidth** > **100 Hz**.
9. Select **Sweep** > **Number of Points** > **401**.
10. Connect the ECal module to the PNA USB port on the front or rear panel. This procedure assumes you are using a ECal. If you are not, see “1-Port Calibration Procedure”, step 2 on page 47.

Figure 42 Test Set to PNA Connections

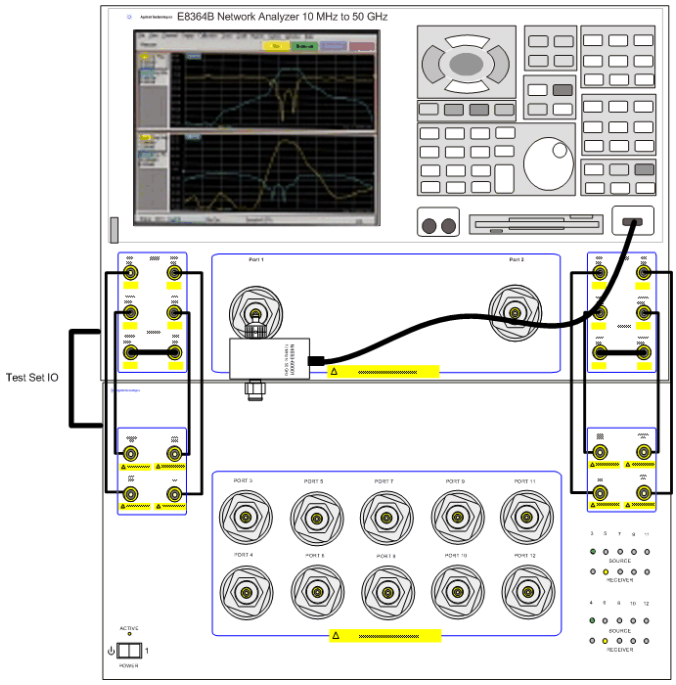


11.Allow the ECal module, Test Set and PNA to warm up for a minimum of 30 minutes.

1-Port Calibration Procedure

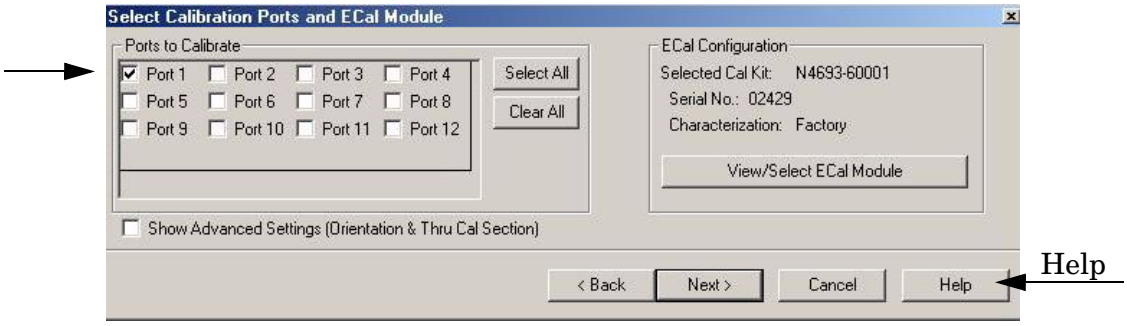
1. Connect the ECal or the mechanical cal kit to Port 1 or the port you are testing. Torque to 8 in-lb. For more information press the **Help** button, see Figure 43.

Figure 43 ECal at Port 1



2. Perform a 1-Port Calibration on Port 1. On the PNA, press **Calibration** > **Calibration Wizard**.
   a. If using a mechanical cal kit, select **SmartCal**.
   b. If using an ECal module, select **ECal**.
3. Continue following the Cal Wizard prompts. In the "Select Calibration Ports and ECal Module" window, press **Clear All** and select **Port 1,** then press **Next**.

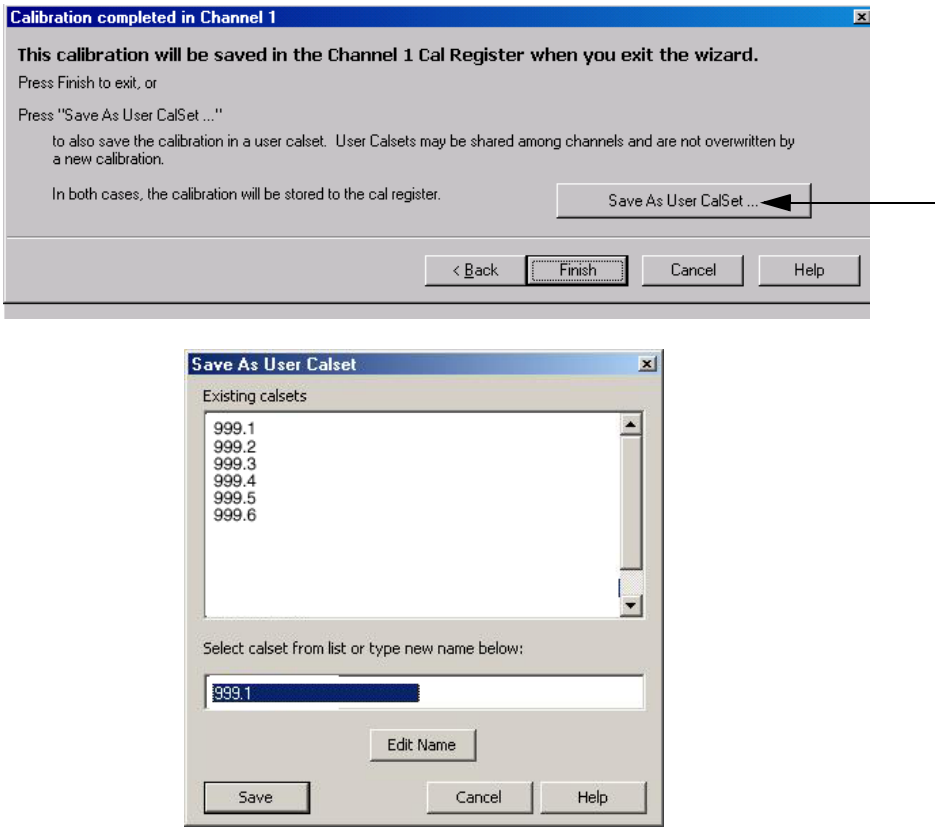
Figure 44 1-Port Calibration



4. In the “Electronic Calibration Step 1 of 1” window, press **Measure**.
5. At the Calibration Completed prompt, select **Save As User Calset** and type the name **999.1**. Overwrite the Calset if it already exists. Press **Save.**

NOTE If you do not have a key board, select **Save As User Calset** > **Edit Name** and save as **999.x.** X is the port number you are calibrating. See Figure 45.

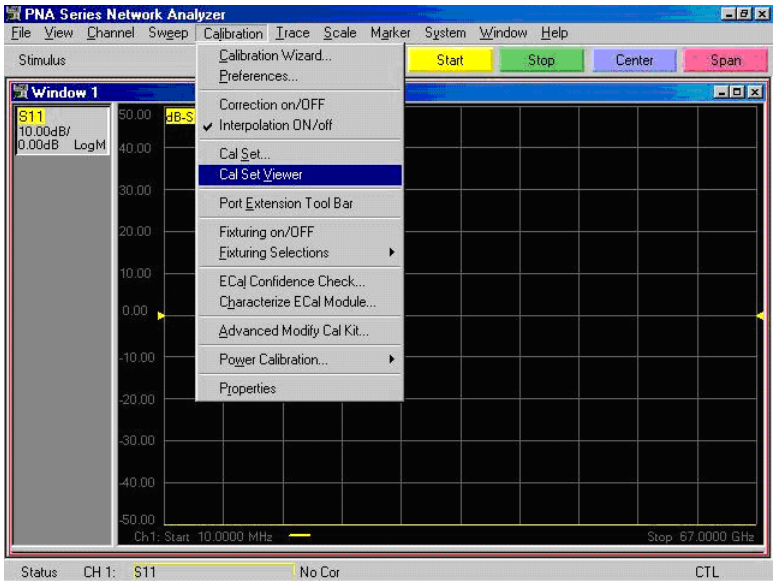
Figure 45 Calibration Complete


Calibration completed in Channel 1
This calibration will be saved in the Channel 1 Cal Register when you exit the wizard.
Press Finish to exit, or
Press "Save As User CalSet ..."
to also save the calibration in a user calset. User Calsets may be shared among channels and are not overwritten by a new calibration.
In both cases, the calibration will be stored to the cal register.
Save As User CalSet ...
< Back
Finish
Cancel
Help
Save As User Calset
Existing calsets
999.1
999.2
999.3
999.4
999.5
999.6
Select calset from list or type new name below:
999.1
Edit Name
Save
Cancel
Help

6. Repeat step 1 thru step 5 (1-Port Calibration Procedure) for Ports 2 thru 12. When finished, there should be twelve Cal Sets saved with the titles “999.1” thru “999.12” (12-Port).

   If you are using an ECal module you can verify the individual port calibration by selecting **Calibration** > **ECal Confidence Check**. For further information refer to the system **Help** menu.
7. Press **Trace** > **Delete Trace**. There should be no traces on the PNA screen.
8. Select **Calibration** > **Cal Set Viewer** to launch the Cal Set Viewer toolbar. Refer to Figure 46 on page 49.

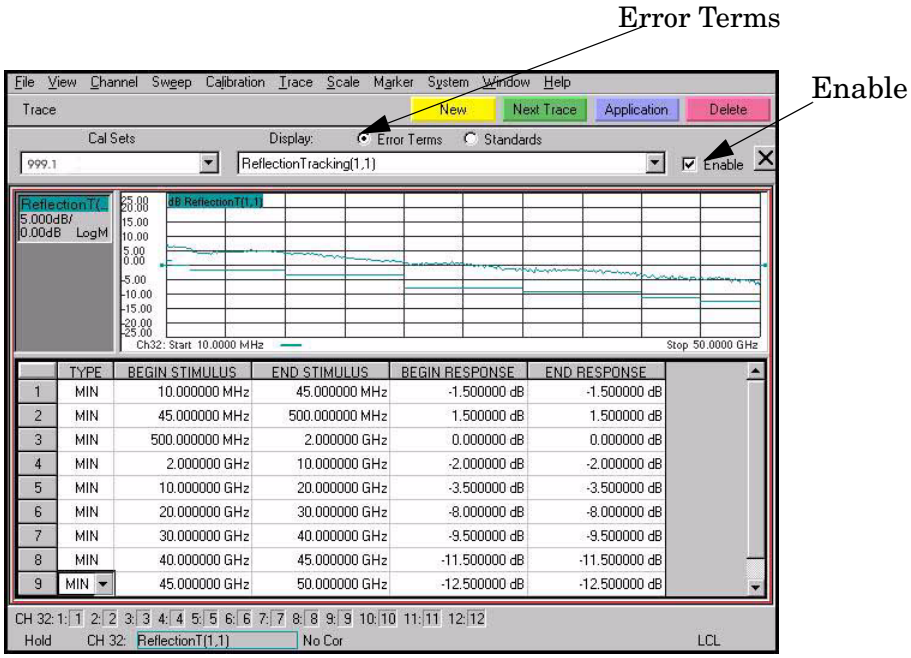
Figure 46 Calibration, Cal Set Viewer



9. From the Cal Sets drop-down menu, select **999.x** (the next sequential number). Select the **Reflection Tracking(1,1)** term in the center drop-down menu and ensure that the **Enable** and **Error Terms** are selected as shown in Figure 47.

NOTE You may also create a table on the PNA and enter the limit line stimulus and response values. Select **Limit Test ON** and **Limit Line ON,** and press **Show Table**. See Figure 47.

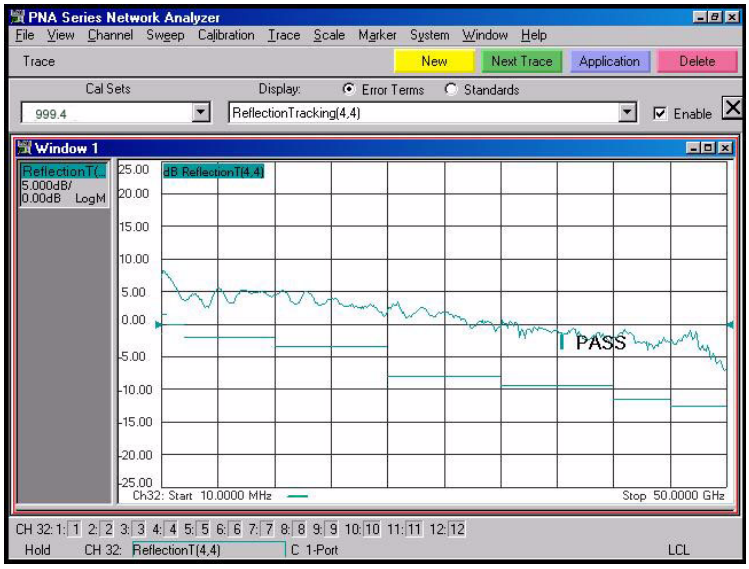
Figure 47 Limit Values for Reflection Tracking Trace (Port 1-12)


Error Terms
Enable
File View Channel Sweep Calibration Trace Scale Marker System Window Help
Trace
New Next Trace Application Delete
Cal Sets
Display:
Error Terms
Standards
999.1
ReflectionTracking(1,1)
Enable
Ch32: Start 10.0000 MHz
Stop 50.0000 GHz
TYPE BEGIN STIMULUS END STIMULUS BEGIN RESPONSE END RESPONSE
1 MIN 10.000000 MHz 45.000000 MHz -1.500000 dB -1.500000 dB
2 MIN 45.000000 MHz 500.000000 MHz 1.500000 dB 1.500000 dB
3 MIN 500.000000 MHz 2.000000 GHz 0.000000 dB 0.000000 dB
4 MIN 2.000000 GHz 10.000000 GHz -2.000000 dB -2.000000 dB
5 MIN 10.000000 GHz 20.000000 GHz -3.500000 dB -3.500000 dB
6 MIN 20.000000 GHz 30.000000 GHz -8.000000 dB -8.000000 dB
7 MIN 30.000000 GHz 40.000000 GHz -9.500000 dB -9.500000 dB
8 MIN 40.000000 GHz 45.000000 GHz -11.500000 dB -11.500000 dB
9 MIN 45.000000 GHz 50.000000 GHz -12.500000 dB -12.500000 dB
Hold CH 32: ReflectionT(1,1) No Cor LCL

10. Compare the Reflection Tracking (1,1) trace to the appropriate limits in Table 12 on page 43. This can be done using Limit Lines (press **Trace** > **Limit Test**) or **Marker**. The trace should be above the limit line and PASS will be displayed on the screen. Refer to Figure 48.

11. Repeat step 9 and step 10 for Cal Sets “999.1” thru “999.12” (12-Port).

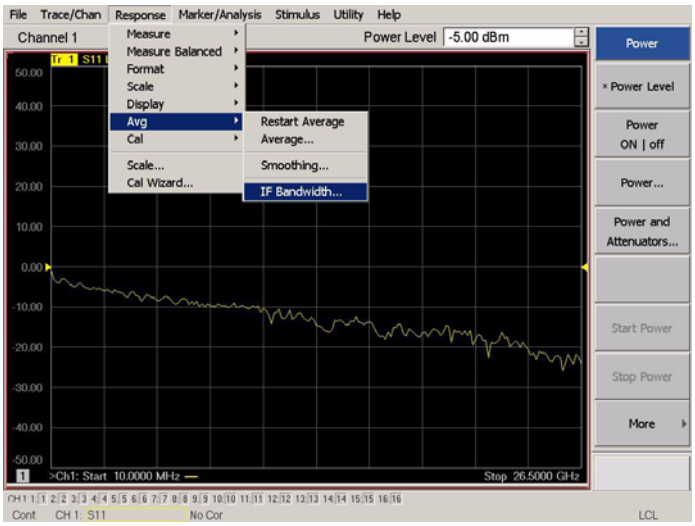
Figure 48 E8364B/C Reflection Tracking Trace (Ports 1-12)



Operational Check Procedure with E8363/4C and N5230C

1. Connect the Test Set to the 2-Port E8363/4C or N5230C 2-Port PNA as shown in Figure 10, Table 11 on page 42, Table 8 and Table 8 on page 17.
2. Turn On the Test Set.
3. On the E8363/4C and N5230C, press **Response** > **CAL** > **Manage CALS** > **CAL Set**. Delete or Rename any Cal Sets titled “999.1” thru “999.12” (12-Port), although it is unlikely that you will find Cal Sets with these names.
4. Verify that the PNA is in 12-Port. See the bottom of the measurement window.
   a. If only four S-Parameters are listed, press **Utility** > **System** > **Configure** > **Multiport Capability**. On the Multiport Restart dialog, select **Restart as multiport PNA with this test set**. Select **U3025AE10** (12-Port).
5. Press **Preset.**
6. Verify that the **[Stop Frequency]** is set to **[50 GHz]**.
7. Verify that the **[Start Frequency]** is set to **[10 MHz]**.
8. Verify that the **[Power]** is to set to **[–17 dBm]**. If not, press **[Power]** > **Power Level** and enter **[–17 dBm].**
9. Select **Response** > **Avg > IF Bandwidth** > **100 Hz**. See Figure 49.
10. Select **Stimulus** > **Sweep** > **Number of Points** > **401**.
11. Connect the ECal module to the network analyzer USB port on the front or rear panel. This procedure assumes you are using a ECal. If you are not, see “1-Port Calibration Procedure” step 2 on page 47.
12. Allow the ECal module, Test Set and PNA to warm up for a minimum of 30 minutes.

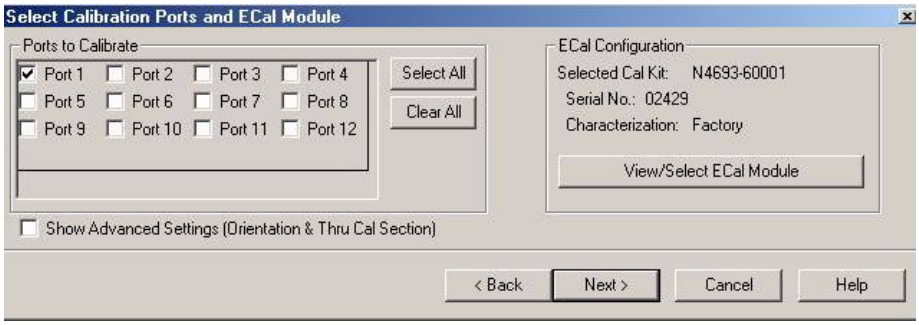
Figure 49 Setting the IF Bandwidth



Operational Check Procedure for E8363/4C and N5230C Systems

1. Connect the ECal or the mechanical cal kit to Port 1 or the port you are testing. Torque to 8 in-lb. For more information press the **Help** button, see Figure 50.
2. Perform a 1-Port Calibration on Port 1. On the PNA, press **Response** > **CAL > Start Cal > Calibration Wizard**.
   a. If using a mechanical cal kit, select **SmartCal**.
   b. If using an ECal module, select **ECal**.
3. Continue following the Cal Wizard prompts. In the "Select Calibration Ports and ECal Module" window, press **Clear All** and select **Port 1,** then press **Next**.

Figure 50 1-Port Calibration

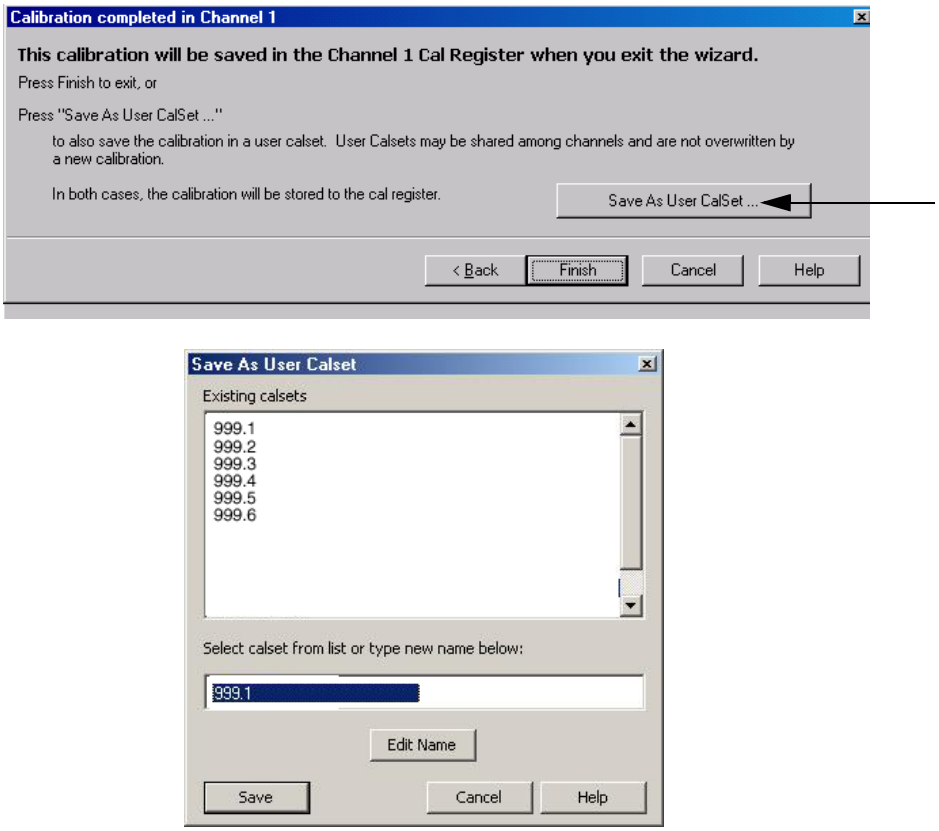


4. Continue to follow the prompts until the "Calibration Completed" window appears.

5. At the Calibration Completed prompt, select **Save As User Calset** and type the name **999.1**. Overwrite the Calset if it already exists. Press **Save.**

NOTE If you do not have a key board, select **Save As User Calset** > **Edit Name** and save as **999.x.** X is the port number you are calibrating. See Figure 51. Use the numeric keypad on the PNA front panel to enter "999.1."

Figure 51 Calibration Complete


Calibration completed in Channel 1
This calibration will be saved in the Channel 1 Cal Register when you exit the wizard.
Press Finish to exit, or
Press "Save As User CalSet ..."
to also save the calibration in a user calset. User Calsets may be shared among channels and are not overwritten by a new calibration.
In both cases, the calibration will be stored to the cal register.
Save As User CalSet ...
< Back
Finish
Cancel
Help
Save As User Calset
Existing calsets
999.1
999.2
999.3
999.4
999.5
999.6
Select calset from list or type new name below:
999.1
Edit Name
Save
Cancel
Help

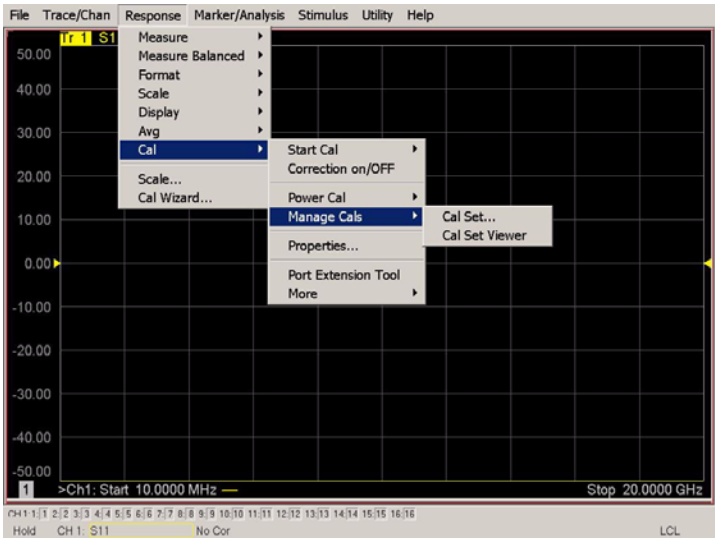
6. Repeat step 1 thru step 5 (1-Port Calibration Procedure) for Ports 2 thru 12. When finished, there should be twelve Cal Sets saved with the titles “999.1” thru “999.12” (12-Port).

   If you are using an ECal module you can verify the individual port calibration by selecting **Response** > **CAL** > **More** > **ECAL** > **ECAL Confidence Check**. For further information refer to the system **Help** menu.

7. Press **Trace/Chan** > **Trace** > **Delete Trace**. There should be no traces on the PNA screen.

8. To launch the Cal Set Viewer toolbar. Select **Response** > **CAL** > **Manage CALS** > **CAL Set Viewer**.

Figure 52 Calibration, Cal Set Viewer



9. From the Cal Sets drop-down menu, select **999.1** and check **Enable**. Select the **Reflection Tracking(1,1)** term in the center drop-down menu and ensure that the **Enable** and **Error Terms** are selected.

NOTE You may also create a table on the network analyzer and enter the limit line stimulus and response values. Select **Limit Test ON** and **Limit Line ON**, and select **Show Table**. See Figure 53.

Figure 53 PNA-X Setting the Test Limits

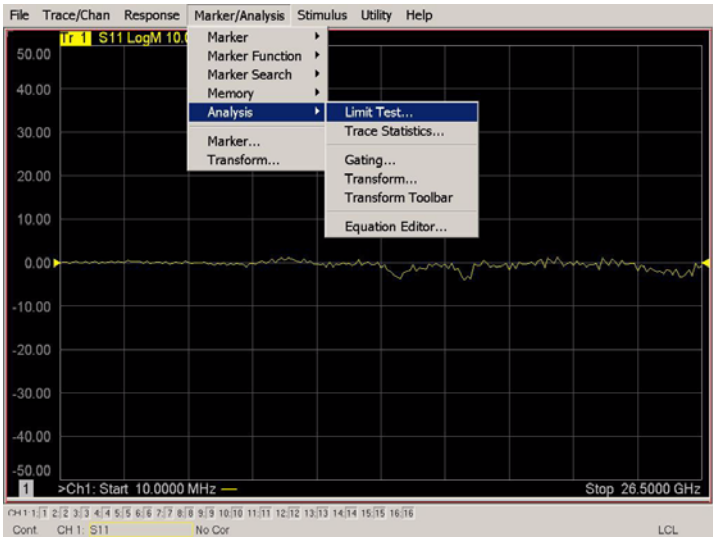
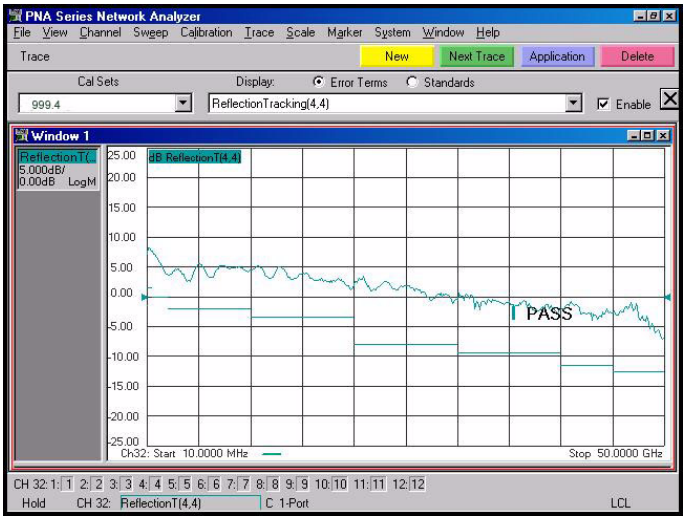


Figure 54 Reflection Tracking Trace (Port 1-2)



10. Compare the Reflection Tracking (1,1) trace to the appropriate limits in Table 12 on page 43. This can be done using Limit Lines (press **Marker/Analysis** > **Analysis** > **Limit Test**). The trace should be above the limit. PASS will be displayed on the screen if the limit lines are used.

11. Repeat step 9 and step 10 for Cal Sets “999.1” thru “999.12” (12-Port).

NOTE For Ports 3-12 the response from 10 MHz to 500 MHz is normal due to the PNA-X Couplers in comparison to the U3022AE10 bridges. The bridges have more gain in the coupled RF path.

Troubleshooting Operational Check Failures

If your test results fail the Operational Check limits, verify following:

1. Insure that the test set is turned on and connected properly to the PNA.
2. Check all appropriate network analyzer and test set connectors for damage, cleanliness, and proper torque.
3. Repeat the relevant 1-Port calibrations.
4. Verify that the stand-alone network analyzer is operating properly and meeting its published specifications. Refer to "Network Analyzer Requirement" on page 4.

Interconnect Cable Verification

1. Connect the Test Set to the PNA and select Multiport mode.
2. Verify the Source Interconnect RF cables (Source Out and CPLR THRU).
   a. Remove the Receiver and CPLR ARM interconnect cables and install the standard PNA jumpers.
   b. Connect an RF cable from Port 1 to Port 2 on the PNA.
   c. Set the PNA to measure Trace S12 and S21 and verify that there are no power holes. If S12 has a power hole check the Port-2 Source interconnect cables and test set connectors for damage. If S21 has a power hole check the Port-1 Source interconnect cables and test set connectors for damage.
3. Verify the Receiver Interconnect RF cables (Receiver A IN or B IN and CPLR ARM).
   a. Re-install the Receiver and CPLR ARM interconnect cables.
   b. Remove the Source Out and CPLR THRU interconnect cables and install the standard PNA jumpers.
   c. Connect an RF cable from Port 1 to Port 2 on the PNA.
   d. Set the PNA to measure Trace S12 and S21, and verify that there are no power holes. If S12 has a power hole check the Port-1 Receiver Interconnect cables and test set connectors for damage. If S21 has a power hole check the Port-2 Receiver Interconnect cables and test set connectors for damage.
4. If the problem still exists, connect the standard jumpers to the PNA (Source and Receiver) and verify the Source Out to CPLR THRU and A/B IN to CPLR ARM switch paths.
   a. Set the PNA to measure trace S12.
   b. Connect Port-1 to Source Out and Port-2 to CPLR THRU connectors on the test set. If a power hole still exists refer to "Contacting Agilent" on page 65.
   c. Connect Port-1 to Receiver A IN or B IN and Port-2 to CPLR ARM connectors on the test set. If a power hole still exists refer to "Contacting Agilent" on page 65.

Theory of Operation

The following is a description of the operation of the U3025AE10. Reference the U3025AE10 block diagrams shown in Figure 55 on page 58. This section assumes the user has a general understanding of couplers, switches, and network analyzers.

RF Switch Components

All RF switches are mechanical. The switches select the RF paths from the PNA Source and Receiver through interconnect cables to Test Set port paths 3 through 12.

Source to Odd Ports (1-11)

The Port 1 Source Output from the PNA is routed into a matrix of switches in the Test Set. This matrix routes the Source to one of the 6 odd ports and terminates the other odd ports.

Source to Even Ports (2-12)

The Port 2 Source Output from the PNA is routed into a matrix of switches in the Test Set. This matrix routes the Source to one of the 6 even ports and terminates the other even ports.

Receiver to Odd Ports (1-11)

The Port 1 Receiver Input from the PNA is routed into a matrix of switches in the Test Set. This matrix routes one of the signals from the 6 odd ports to the PNA “A Receiver” and terminates the other odd ports.

Receiver to Even Ports (2-12)

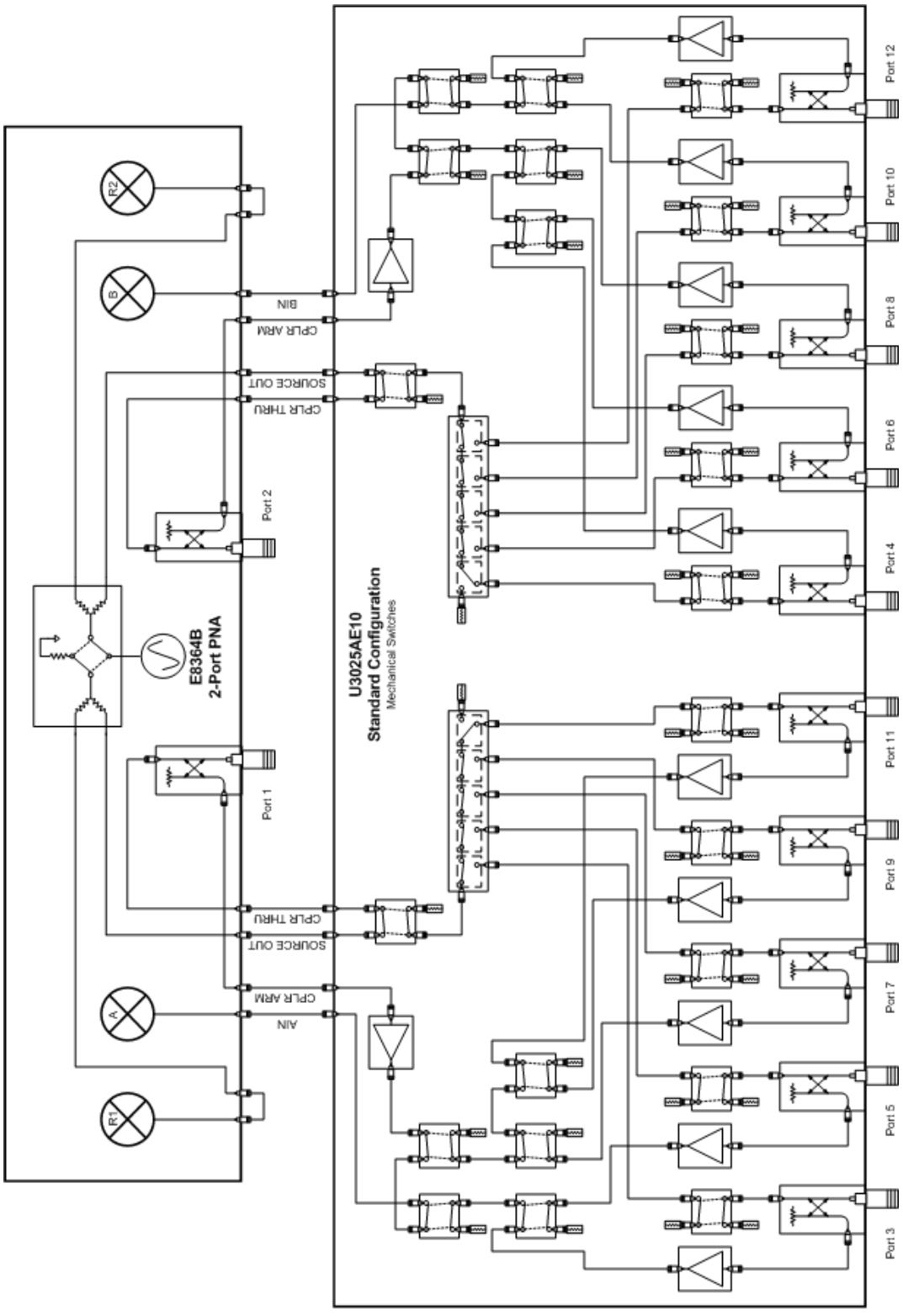
The Port 2 Receiver Input from the PNA is routed into a matrix of switches in the Test Set. This matrix routes one of the signals from the 6 even ports to the PNA “B Receiver” and terminates the other even ports.

RF Coupler Components

Test set ports (3 - 12) provide the signal separation of the source and receiver paths. The test set ports can either stimulate or receive a signal to the DUT.

System Block Diagrams

Figure 55 Standard Configuration



Service Information

Refer to "Contacting Agilent" on page 65.

WARNING **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.**

WARNING **These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.**

Replaceable Parts

NOTE Special options are built to order, so long lead times may be encountered when ordering replacement parts.

Description	Agilent Part Number
Interconnect Cable	8120-6818
RF Cable, Semi-rigid	U3025-20044
RF Cable, Semi-rigid	U3025-20045
Lock Feet	5023-0132
Lock Feet Kit	5063-9253
Screw	0515-1619

Safety and Regulatory Information

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Before Applying Power

Verify that the product is configured to match the available main power source. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Connector Care and Cleaning

If alcohol is used to clean the connectors, the power cord to the instrument must be removed. All cleaning should take place in a well ventilated area. Allow adequate time for the fumes to disperse and moist alcohol to evaporate prior to energizing the instrument.

WARNING **To prevent electrical shock, disconnect the Agilent Technologies model product from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

Shipping Instructions

You must always call the Agilent Technologies Instrument Support Center to initiate service before retuning your instrument to a service office. See “Contacting Agilent” on page 65. Always transport or ship the instrument using the original packaging if possible. If not, comparable packaging must be used. Attach a complete description of the failure symptoms.

Declaration of Conformity

A declaration of conformity is on file for the PNA models, and a copy is available upon request.

Compliance with German Noise Requirements

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrerordnung-3. GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA<70 dB	Lpa<70 dB
Operator Position	am Arbeitsplatz
Normal Operation	normaler Betrieb
per ISO 7779	nach DIN 45635 t. 19

EMC Information

Complies with European EMC Directive 89/336/EEC, amended by 93/68/EEC

- IEC/EN 61326

This product complies with the radiated electromagnetic field immunity requirement in IEC/EN 61326 using performance criterion B. Degradation of some product specifications can occur in the presence of ambient electromagnetic fields. The product self-recovers and operates as specified when the ambient field is removed.

- CISPR Pub 11 Group 1, class A
- AS/NZS CISPR 11:2002
- This ISM device complies with Canadian ICES-001.
  Cet appareil ISM est conforme a la norme NMB du Canada.

Safety Information

Complies with European Low Voltage Directive 2006/95/EC

- IEC/EN 61010-1:2001
- Canada: CSA C22.2 No. 61010-1:2001
- USA: UL 61010-1

Warnings

WARNING	**The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, which if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

Warnings applicable to this instrument are:

WARNING	**To prevent electrical shock, disconnect the Agilent Technologies U3025AE10 from the mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

WARNING	**For continued protection against fire hazard replace line fuse only with same type and rating:• Fuse 5A/250V, Part Number 2110-0709 The use of other fuses or material is prohibited.**

WARNING	**This is a Safety Class I product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall be inserted only into a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous. Intentional interruption is prohibited.**

WARNING	**No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.**

WARNING	**The opening of covers or removal of parts is likely to expose dangerous voltages. Disconnect the instrument from all voltage sources while it is being opened.**

WARNING	**If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

WARNING	**The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch (disconnecting device).**

Cautions

CAUTION The CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

Cautions applicable to this instrument are:

CAUTION Always use the three-prong ac power cord supplied with this instrument. Failure to ensure adequate earth grounding (by not using this cord) can cause instrument damage.

CAUTION This instrument has autoranging line voltage input; be sure the supply voltage is within the specified range.

CAUTION Ventilation Requirements: When installing the instrument in a cabinet, the convection into and out of the instrument must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the instrument by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, forced convection must be used.

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010-1:2000, and 664 respectively.

Instrument Markings

The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the documentation.

This symbol indicates that the instruction requires alternating current (ac) input.

This symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive, 2002/96/EC).

This symbol indicates that the power line switch is ON.

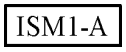
This symbol indicates that the power line switch is in the STANDBY position.

This symbol indicates that the power line switch is in the OFF position.

This symbol is used to identify a terminal which is internally connected to the product frame or chassis.

The CE mark is a registered trademark of the European Community. (If accompanied by a year, it is when the design was proven.)

The CSA mark is a registered trademark of the Canadian Standards Association. This instrument complies with Canada: CSA 22.2 No. 000000061010-1, Second Edition.



This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.

This is a marking to indicate product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001).

Direct Current.

This is a required mark signifying compliance with an EMC requirement. The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.

China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001.

This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.

Contacting Agilent

Assistance with test and measurement needs, and information on finding a local Agilent office are available on the Internet at:
http://www.agilent.com/find/assist

You can also purchase accessories or documentation items on the Internet at:
http://www.agilent.com/find

If you do not have access to the Internet, contact your field engineer.

NOTE In any correspondence or telephone conversation, refer to the product by its model number and full serial number. With this information, the Agilent representative can determine whether your unit is still within its warranty period.